

Telsta A-28D Lift Cylinder Rebuild Manual

Removal, Seal Replacement, Reassembly,
Installation, and Hydraulic Recommissioning



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Equipment Covered

Telsta A-28D aerial device

Lift/elevation cylinder assembly markings observed: T-88887 and 7911-001-09-10

Cylinder Measurements

Rod diameter: 1.75 in.

Cylinder bore: 3.50 in.

Hydraulic Fluid

Dexron-compatible automatic transmission fluid (ATF), per Telsta manual reference

Prepared From

Field-documented teardown, seal replacement, reassembly, installation, and testing



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Chapter 1 - Introduction

1.1 Purpose

This publication provides a complete, field-verified procedure for rebuilding the Telsta A-28D lift hydraulic cylinder. It combines engineering principles, practical field techniques, inspection criteria, and verified rebuilding methods developed during a successful overhaul.

1.2 Equipment Covered

This manual applies to the Telsta A-28D lift hydraulic cylinder. Measurements, seal arrangements, installation methods, and procedures were verified on the documented rebuild.

1.3 Technical Specifications

Item	Verified Information
Machine	Telsta A-28D
Component	Lift Hydraulic Cylinder
Cylinder Type	Double Acting
Rod Diameter	1.750 in. (44.45 mm)
Bore Diameter	3.500 in. (88.90 mm)
Hydraulic Fluid	Dexron-compatible Automatic Transmission Fluid (ATF)
Replacement Seal Kit	Matched by Nu-Way Hydraulics

1.4 About This Manual

This manual documents practical rebuilding methods that are typically absent from factory literature, including seal protection, Hallite rod seal installation, cartridge valve removal, temporary alignment pins, mounting pin sequencing, and field-proven installation techniques.

1.5 Intended Audience

Designed for equipment owners, fleet mechanics, hydraulic technicians, and experienced DIY mechanics. Specialized hydraulic rebuilding equipment is not required.

1.6 Mechanical Skill Level

Overall difficulty: Intermediate. Success depends more on patience, cleanliness, and careful inspection than specialized tools.

1.7 Estimated Time

Cylinder Removal: 30-60 min
Disassembly: 45-60 min
Inspection: 30-45 min
Seal Replacement: 45-60 min
Reassembly: 45-60 min
Installation: 30-45 min

Hydraulic Testing: 20-30 min

Total: Experienced technician 4-6 hours; First-time rebuild 6-10 hours.

1.8 Work Area Preparation

Prepare a clean workbench, organize components in removal order, photograph every assembly before disassembly, and keep new seals packaged until required.

1.9 Cleanliness

Hydraulic systems are intolerant of contamination. Protect polished surfaces, cover hydraulic ports whenever practical, and lubricate all seals with clean Dexron-compatible ATF during assembly.

1.10 How This Manual Is Organized

Each procedure includes an objective, required tools, procedure, inspection criteria, workshop tips, common mistakes, and a clear next step.

1.11 Verification

Every procedure was validated during a complete rebuild, reinstallation, pressure test, and successful return to service without leakage.

1.12 Philosophy

Understand every component before forcing any operation. A successful rebuild comes from knowledge, cleanliness, patience, and careful workmanship.

Chapter Summary

The reader should now understand the purpose, scope, specifications, philosophy, and organization of this publication and be prepared to continue to Chapter 2: Understanding the Lift Hydraulic Cylinder.

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Chapter 2

Understanding the Lift Hydraulic Cylinder

Chapter Objective

Before beginning disassembly, it is important to understand how the lift cylinder works and what role each component performs. Understanding component function makes inspection easier and reduces the chance of incorrect assembly.

2.1 How the Cylinder Works

The Telsta A-28D lift cylinder is a double-acting hydraulic cylinder. Hydraulic pressure is alternately applied to each side of the piston. Pressure entering the base end extends the rod, while pressure entering the rod end retracts it. Oil displaced from the opposite chamber returns to the control valve and ultimately to the hydraulic reservoir.

2.2 Major Components

Component	Purpose
Cylinder Barrel	Pressure vessel that houses the piston assembly.
Rod	Transfers hydraulic force to the boom.
Gland	Supports the rod and contains the rod sealing system.
Piston	Separates the extend and retract chambers.
Rod Seal	Primary dynamic pressure seal.
Wiper Seal	Prevents dirt and moisture from entering the cylinder.
Gland O-Ring	Static pressure seal between gland and barrel.
Backup Ring	Supports the gland O-ring under pressure.
Wear Ring	Centers the piston and prevents metal-to-metal contact.
Rod O-Ring	Static seal for the spacer assembly.
Cartridge Valve	Allows hydraulic flow and influences pressure equalization during service.

2.3 Seal Functions

- Wiper Seal:** Keeps contaminants out of the cylinder.
- Rod Seal:** Prevents hydraulic oil from escaping around the rod.
- Gland O-Ring:** Seals the threaded gland to the barrel.
- Backup Ring:** Prevents O-ring extrusion under pressure.
- Piston Seal:** Separates pressure between both chambers.
- Wear Ring:** Supports side loads and keeps the piston centered.

2.4 Understanding Hydraulic Pressure

Every pressure seal has a pressure side. Dynamic seals such as the rod seal and piston seal must be installed in the correct orientation so hydraulic pressure energizes the sealing lip. Static seals such as O-rings rely on compression rather than lip orientation.

2.5 Air in the Cylinder

During rebuilding, air enters both chambers of the cylinder. This is normal. Once installed, slow extension and retraction cycles purge trapped air back through the hydraulic system into the reservoir. Manual bleeding of the cylinder is not required.

2.6 Failure Modes

Typical seal failures include torn wiper lips, worn rod seals, hardened O-rings, damaged piston seals, and cracked wear rings. Chrome rod damage, contamination, and improper seal installation are common causes of premature leakage.

Mechanic's Notes

- The rod seal feels extremely tight until approximately 90% installed; continue working the final section until it snaps into place.
- The wear ring is not a pressure seal; it is a bearing surface.
- Removing the cartridge valve before rod installation reduces hydraulic suction and simplifies assembly.

Chapter Summary

The reader should now understand the purpose of every major cylinder component, the function of each seal, basic hydraulic operation, and the inspection concepts used throughout the remainder of this manual.

Proceed to Chapter 3: Required Tools & Supplies.

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Chapter 3

Required Tools & Supplies

Revision C - Complete field tool documentation

Chapter Objective

This chapter identifies the tools, materials, and consumables required to remove, rebuild, and reinstall the Telsta A-28D lift cylinder. It includes the exact socket arrangement used for the recessed rear-pin retaining bolt and a complete photographic breakdown of the custom driver fabricated to remove the recessed rear mounting pin.

3.1 Core Tool List

Tool / Supply	Primary Use	Field-Proven Notes
36 in. pipe wrench	Loosen and tighten the threaded gland.	Remove the 7/64 in. locking screw first. Support the barrel close to the gland with wood blocks.
Heavy bench vise	Hold the cylinder base eye during gland removal.	Protect painted and machined surfaces. Do not clamp the polished rod.
7/64 in. hex key	Remove the gland locking screw.	Clean dirt from the socket before inserting the key. Remove the screw completely.
2 in. box-end wrench	Remove and reinstall the piston retaining nut.	The box end worked successfully when a 2 in. impact socket was unavailable locally.
Rubber mallet	Seat the piston and gland seals evenly.	Use light taps around the circumference. Never strike the chrome rod.
Masking tape	Protect new seals from the threaded rod end.	Cover every thread crest and lightly lubricate the tape with clean ATF.
Cloth emery	Clean rust and oxidation from mounting pins.	Use with PB Blaster or WD-40 and rotate the pin while polishing.
Fresh chassis grease	Lubricate mounting pins and cylinder-eye bushings.	Remove old contaminated grease before applying fresh grease.
Dexron-compatible ATF	Hydraulic fluid and assembly lubricant.	Lubricate every new seal and the cylinder bore before assembly.
6 or 12 in. socket extension	Temporary alignment pin during cylinder installation.	Insert through the mounting holes to hold alignment while the real pin is driven in.
Bottle jack and 2x4 support	Support the boom and unload the mounting pins.	Place the support in the boom cradle and make small height adjustments until the pins are free.
Custom recessed pin driver	Drive the rear mounting pin through the limited-access opening.	Field-made from a hammer-drill side handle, jack-post screw, dense sponge or foam spacer, and short sledge hammer.

3.2 Exact Socket Setup for the Passenger-Side Rear-Pin Retaining-Plate Bolt

The passenger-side retaining plate for the rear cylinder mounting pin is recessed inside the boom armature. A straight socket and ratchet do not have enough access or the correct working angle. The following 1/2 in. drive, impact-rated arrangement was successfully used through the factory access hole:

Position in the setup	Required tool
At the retaining bolt	9/16 in. impact socket
Angle correction inside the armature	1/2 in. drive impact universal joint / swivel
Reach through the access hole	5 in. long, 1/2 in. drive impact extension
Drive tool	1/2 in. impact wrench or ratchet, as space permits



Figure 3-1. Field-tested 9/16 in. impact socket, 1/2 in. impact swivel, and 5 in. impact extension used through the boom access hole.

Removal Procedure

1. Confirm the boom is securely supported and the mounting pin is no longer carrying boom load.
2. Locate the factory access hole on the passenger side of the boom armature.
3. Assemble the 9/16 in. impact socket, the 1/2 in. drive impact swivel, and the 5 in. impact extension in that order.
4. Guide the socket through the access hole and seat it fully on the retaining-plate bolt.
5. Keep the socket squarely seated while loosening the bolt. The swivel should correct the access angle rather than forcing the socket sideways.
6. Remove the bolt and retaining plate before attempting to drive out the rear mounting pin.

IMPORTANT: Use impact-rated components. The offset access angle applies side loading to the swivel. Standard chrome swivels and extensions are more likely to separate or fail under impact load.

VERIFIED SOURCE: The complete impact setup used during the rebuild was contained in the large Quinn 1/2 in. drive impact set sold by Harbor Freight at that time.

3.3 Custom Driver for the Recessed Rear Mounting Pin

After the retaining plate is removed, the rear mounting pin must be driven through a confined opening where a conventional punch cannot be held safely. The following improvised driver was built from common items and successfully used during the documented cylinder removal.

Component Breakdown



Figure 3-2. Components used to fabricate the recessed-pin driver: hammer-drill side handle, jack-post adjusting screw, dense sponge or foam spacer, and short sledge or club hammer.

Component	Function
A. Hammer-drill auxiliary side handle	Provides an offset handhold so the driver can be guided while the operator keeps both hands away from the direct hammer path.
B. Jack-post adjusting screw	Acts as the long driver. The small rounded end contacts the mounting pin. The large round swivel foot becomes the striking surface.
C. Dense household sponge or foam	Fills the space around the side-handle clamp, cushions the metal foot, and helps keep the jack screw stable in the handle.
D. Short sledge or club hammer	Applies controlled impact to the large round foot of the jack screw.

Tool Assembly

1. Remove the auxiliary side handle from the hammer drill. The handle must include its adjustable circular clamp and tightening knob.
2. Cut or fold a section of dense sponge or foam so it fits snugly inside the clamp area and around the jack-post screw. The foam is a stabilizing spacer, not the striking component.
3. Pass the threaded shaft of the jack-post screw through the side-handle clamp as shown. Position the large round swivel foot against the padded side of the clamp.
4. Tighten the side-handle adjustment knob until the jack screw is held securely enough to guide. Verify that the screw remains straight and cannot easily slip sideways.
5. Confirm that the small rounded end of the jack screw is unobstructed. This end will contact the rear mounting pin.
6. Confirm that the large round swivel foot is fully exposed. This is the surface struck with the short sledge or club hammer.



Figure 3-3. Assembled custom driver. The jack-post screw is held and guided by the auxiliary side handle, with the blue foam acting as a stabilizing spacer.

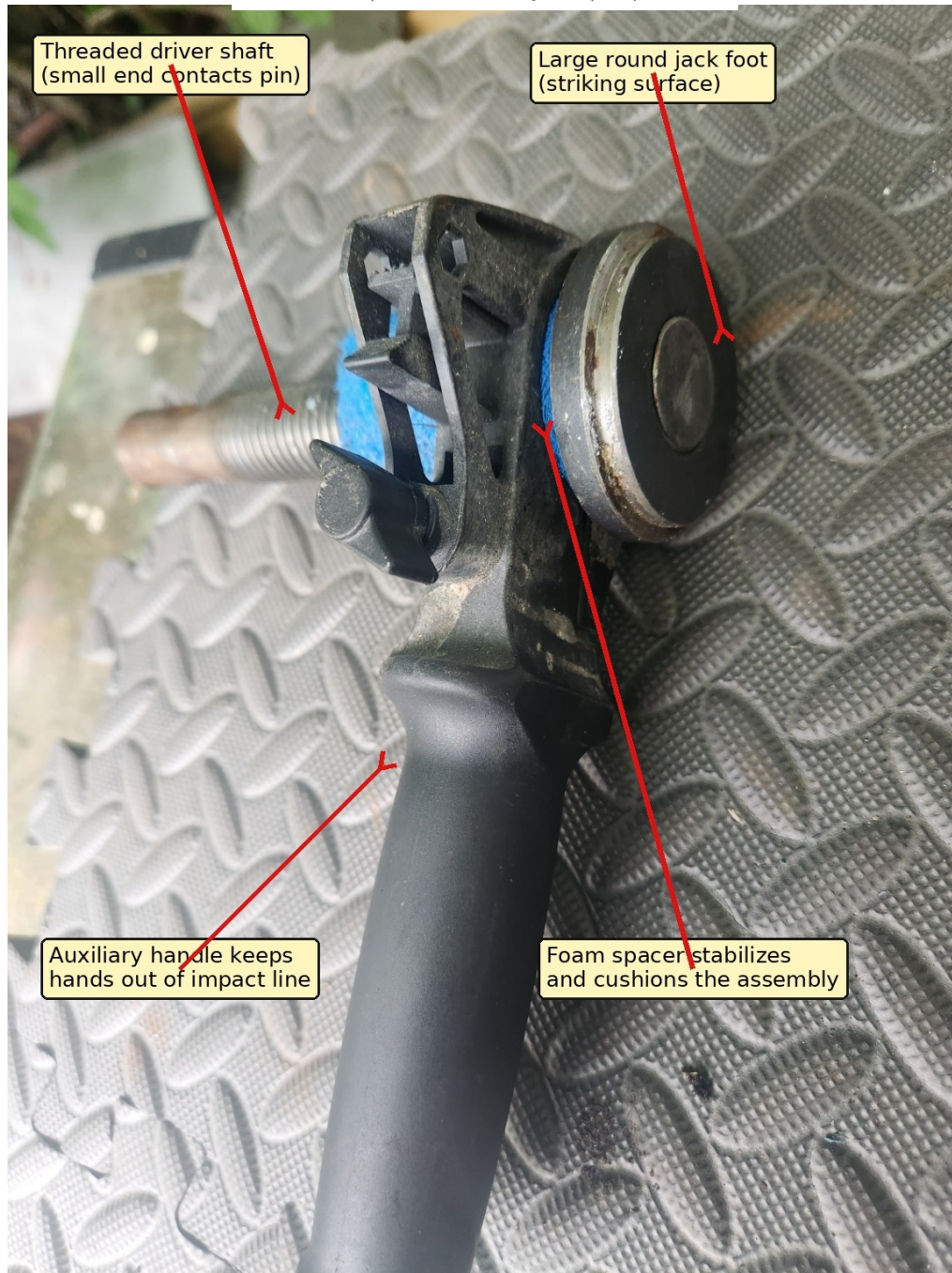


Figure 3-4. Close-up of the assembled driver showing the threaded shaft, padded side-handle clamp, and large round striking foot.

Using the Custom Driver

- 1.** Support the boom securely and adjust the bottle jack or cribbing until the rear mounting pin is no longer carrying boom load.
- 2.** Remove the recessed retaining-plate bolt and retaining plate using the socket arrangement in Section 3.2.
- 3.** Guide the custom driver through the available opening and place the small rounded end of the jack-post screw squarely against the exposed end of the mounting pin.
- 4.** Hold the auxiliary side handle firmly. Keep fingers, hands, and the handle itself out of the direct line between the hammer and the jack screw.
- 5.** Strike the large round jack-post foot with controlled blows from the short sledge or club hammer. Do not swing harder than necessary.
- 6.** After each blow, confirm that the driver remains centered and that the pin is moving. Reposition immediately if the screw begins to slip off center.
- 7.** Continue until the pin clears the cylinder eye. Support the cylinder as the pin releases so the cylinder cannot drop or pivot unexpectedly.



Figure 3-5. Complete field setup with the custom recessed-pin driver and the short sledge used to apply controlled blows.

CAUTION: This is a field-fabricated driver, not a factory service tool. Wear eye protection, keep all body parts out of the impact line, and stop immediately if the tool shifts, bends, or begins to damage the pin.

MECHANIC NOTE: The side handle makes the long jack screw controllable inside the confined boom structure. The foam spacer keeps the screw stable, while the round jack foot provides a broad surface that can be struck safely with controlled blows.

3.4 Workbench and Cleanliness Setup

- Use a clean, stable bench or protected floor area with strong lighting.
- Lay internal components on clean cardboard, towels, or rubber matting - never directly on dirt or bare abrasive steel.
- Arrange components in removal order and photograph every seal before removal.
- Keep new seals packaged until the installation step.
- Keep clean Dexron-compatible ATF and lint-free towels within reach.

3.5 Consumables

Consumable	Use
Dexron-compatible ATF	Seal lubrication, bore lubrication, and system refill.
Fresh chassis grease	Mounting pins, bushings, and thrust faces.
Masking tape	Temporary smooth sleeve over the rod threads.
PB Blaster or WD-40	Cleaning and freeing mounting hardware.
Cloth emery	Polishing surface rust from pins.
Lint-free shop towels	Cleaning internal hydraulic components.
Clean solvent	Degreasing reusable metal parts before inspection.

3.6 Workshop Preparation Checklist

- [] Boom support, bottle jack, and wood cribbing ready
- [] Exact passenger-side socket setup assembled
- [] Custom recessed pin driver assembled and inspected
- [] 36 in. pipe wrench and 2 in. box-end wrench available
- [] Clean work surface and parts trays prepared
- [] Seal set verified against the original parts
- [] Dexron-compatible ATF and chassis grease available
- [] Camera or phone ready for orientation photos
- [] Safety glasses and gloves available

CHAPTER SUMMARY: The work area and tool kit should now be complete. This includes the exact impact socket arrangement required to remove the recessed rear-pin retaining plate and the fully documented custom driver used to drive the rear mounting pin through the confined boom opening. Proceed to Chapter 4 - Cylinder Removal.

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Chapter 4

Cylinder Removal

Revision E - Field removal procedure with photographic references



Figure 4-1. Cylinder after removal and before bench disassembly.

Chapter Objective

This chapter documents the complete field procedure used to remove the Telsta A-28D elevation (lift) cylinder. It combines the Telsta factory removal sequence with the exact boom support, recessed retaining-bolt socket setup, and custom mounting-pin driver used during the successful rebuild.

CRITICAL SAFETY WARNING

The factory procedure specifies elevating the boom to approximately 45 degrees and supporting it with an overhead hoist or a jack rated for at least one ton. Never rely on hydraulic pressure alone. Do not remove a pin, hose, holding valve, or other load-bearing component until the boom has a positive mechanical support.

4.1 Removal Overview

Removal element	Documented requirement
Starting position	Boom elevated to approximately 45 degrees.
Boom support	Overhead hoist or jack rated for at least one ton.
Removal order	Rod-end clevis pin first; base/rear anchor pin last.
Hydraulic lines	Mark, relieve pressure, disconnect, and cap.
Cylinder support	Control cylinder weight throughout pin removal.

Removal Sequence

1. Photograph both cylinder mounts, retaining plates, hose routing, valves, and fittings.
2. Raise and positively support the boom.
3. Unload and remove the rod-end retaining plate and clevis pin.
4. Support or control the freed cylinder rod end.
5. Relieve residual hydraulic pressure; mark and disconnect the hoses.
6. Remove the recessed base/rear retaining plate and mounting pin.
7. Lower the cylinder clear of the machine and protect all ports and polished surfaces.

Completion Targets

- [] All mounting hardware labeled and stored
- [] Hydraulic hoses marked and capped
- [] Cylinder ports protected
- [] Chrome rod protected from contact
- [] Identification markings photographed

SEQUENCE NOTE

Reinstallation uses the base pin first so the cylinder can pivot while the rod end is aligned. Removal uses the rod-end pin first and the base pin last, matching the Telsta factory procedure.

4.2 Locate the Cylinder and Mounting Hardware

Access is confined by the boom structure, hydraulic tubing, and nearby brackets. Identify both cylinder mounting eyes and both retaining systems before beginning.



Figure 4-2. Installed cylinder viewed through the boom structure.



Figure 4-3. Mounting eye captured between the boom brackets.



Figure 4-4. Pin-retaining arrangement: pin end, retaining plate, and 9/16 in. retaining bolt.

PHOTOGRAPH BEFORE REMOVAL

Record the direction of each pin, the position of each retaining plate, hose routing, valve orientation, washers, spacers, and the cylinder mounting-eye direction. These images are the reinstallation reference.

4.3 Raise and Support the Boom

The documented rebuild used a bottle jack and short 2x4 block in the boom cradle. The support both carried the boom and allowed small height changes to unload the mounting pins.



Figure 4-5. Field support arrangement with bottle jack, short 2x4 block, and boom cradle.

Procedure

1. Park on firm, level ground; set the parking brake and secure the work area.
2. Elevate the boom to approximately 45 degrees.
3. Place a minimum one-ton jack beneath the support point. Use a short 2x4 block to distribute the load as shown.
4. Raise the jack until it positively supports the boom; do not lift farther than required.
5. Check pin load. Make small height adjustments until the pins no longer bind or carry boom weight.
6. Leave the mechanical support in place until the cylinder is fully removed.

FEEL CHECK

A loaded pin resists rotation and driving. If a pin will not move, adjust the jack slightly instead of striking harder.

COMMON MISTAKE

Supporting the cylinder does not support the boom. The boom must have an independent mechanical support before any cylinder hardware is removed.

4.4 Relieve Pressure and Disconnect Hydraulic Lines

With the boom mechanically supported, shut the machine down, relieve residual pressure, and clean the fitting area before opening the system.

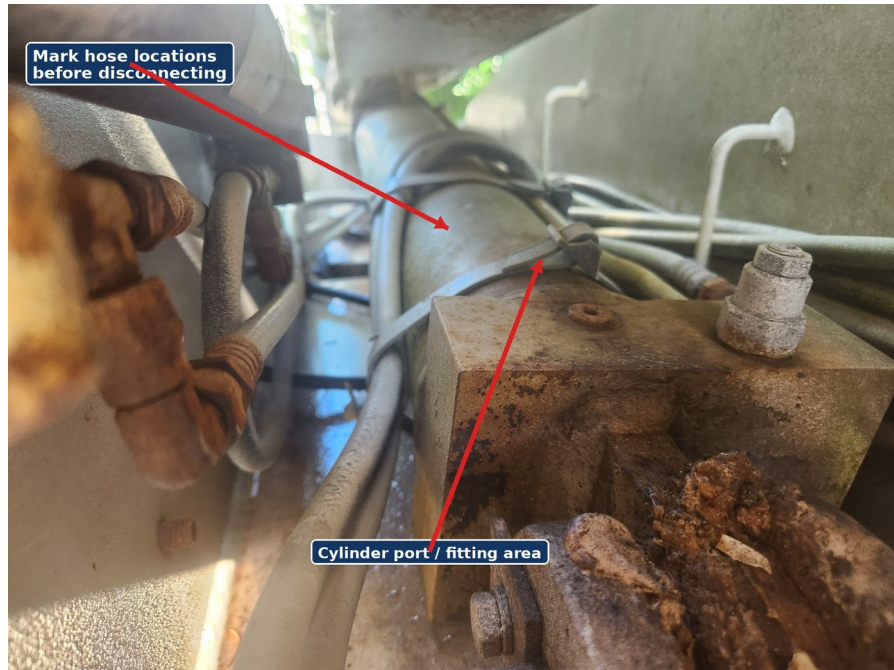


Figure 4-6. Hydraulic connection area. Mark every line before disconnecting it.

Procedure

1. Shut off the power source after the boom is securely supported.
2. Operate the appropriate control momentarily in both directions to reduce residual line pressure without moving the boom off its support.
3. Clean dirt, rust, and loose debris from the fitting area.
4. Mark each hose and its matching port. Photograph the routing.
5. Place absorbent towels or a drain pan beneath the connections.
6. Loosen each fitting slowly. Stop if pressure remains.
7. Cap or plug every open hose and cylinder port immediately.

HYDRAULIC INJURY WARNING

Never use a hand to search for a pressurized leak. High-pressure fluid injection is a medical emergency. Use cardboard or wood during later leak testing.

FIELD NOTE

The exact line-fitting wrench sizes were not recorded. Use a correctly sized line wrench or open-end wrench that fully engages each fitting.

4.5 Remove the Rod-End Retaining Plate and Clevis Pin

The Telsta sequence removes the rod-end clevis pin first. The boom must remain supported, and the cylinder rod end must be controlled as the pin clears.

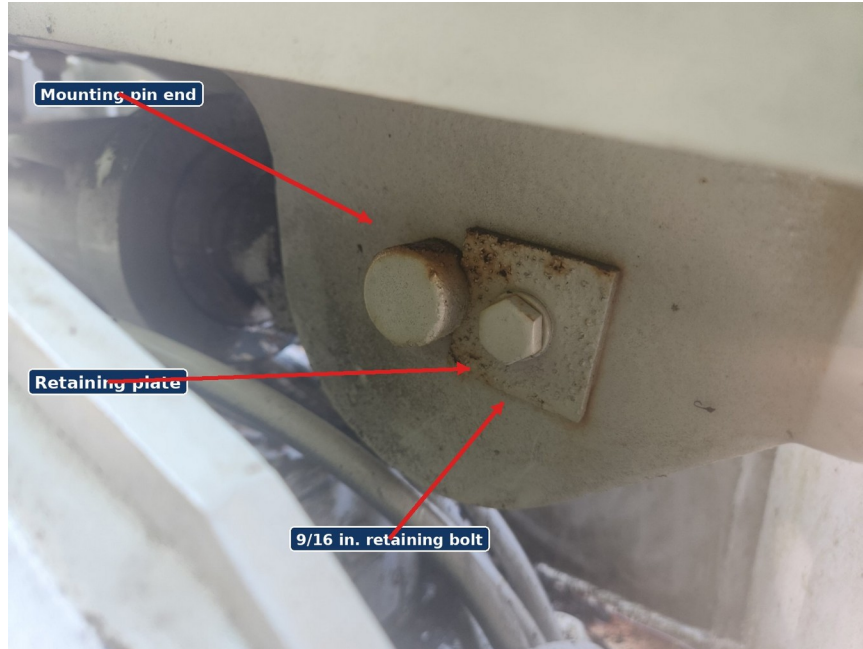


Figure 4-7. Typical retaining plate and mounting-pin arrangement.

Procedure

1. Confirm the boom support is stable and the rod-end pin is unloaded.
2. Remove the retaining-plate bolt.
3. Withdraw the retaining plate from the machined groove in the mounting pin.
4. Support or control the rod end so it cannot fall when the pin clears.
5. Drive or slide the clevis pin out with controlled force.
6. If the pin binds, stop and adjust the boom support slightly.
7. Secure the freed rod end away from the chrome rod, hoses, and boom structure.

DO NOT FORCE A LOADED PIN

Heavy hammering can mushroom the pin, damage the bushing, or deform the retaining groove. Pin resistance is usually an alignment or loading problem.

4.6 Remove the Recessed Base/Rear Retaining Plate

The passenger-side retaining-plate bolt is recessed inside the boom armature. A straight socket and ratchet do not provide the required reach and angle.



Figure 4-8. Exact socket arrangement: 9/16 in. impact socket, impact swivel, and 5 in. impact extension.

Position	Tool
At the bolt	9/16 in. impact socket
Angle correction	1/2 in. drive impact swivel / universal joint
Reach	5 in. long, 1/2 in. drive impact extension
Drive	1/2 in. impact wrench or ratchet, as space permits

Procedure

1. Locate the factory access hole on the passenger side.
2. Assemble the socket, swivel, and extension in that order.
3. Guide the socket through the opening and seat it fully on the retaining bolt.
4. Keep the socket square while loosening the bolt; let the swivel correct the angle.
5. Remove the bolt and retaining plate completely.

4.7 Drive Out the Recessed Base/Rear Pin

A conventional punch cannot be held safely through the confined access opening. The documented rebuild used the custom pin driver detailed in Chapter 3.



Figure 4-9. Assembled custom driver.



Figure 4-10. Broad striking foot.

Procedure

1. Confirm the cylinder is controlled and the base/rear pin is unloaded.
2. Guide the rounded end of the jack-post screw through the opening and squarely against the pin.
3. Hold the auxiliary side handle firmly with hands outside the hammer path.
4. Strike the broad jack-post foot with controlled blows from a short sledge or club hammer.
5. Check centering and pin movement after every few blows.
6. If movement stops, adjust the boom support rather than increasing hammer force.
7. Continue until the pin clears the cylinder eye. Support the cylinder as it releases.

CAUTION - FIELD-FABRICATED TOOL

Stop immediately if the driver slips, bends, or begins to damage the pin. Wear eye protection and keep all body parts outside the impact line.

4.8 Remove and Protect the Cylinder

After both pins and hydraulic hoses are removed, lower the cylinder clear of the mounting brackets while controlling its weight and protecting the rod, ports, and valves.



Figure 4-11. Cylinder lowered onto the work platform.



Figure 4-12. Complete removed cylinder.

Procedure

1. Confirm both hoses are capped and routed out of the removal path.
2. Use a helper or suitable lifting support to control the cylinder.
3. Lower the cylinder clear of the brackets without allowing the rod or fittings to strike the machine.
4. Carry the cylinder horizontally. Do not lift it by a hose, valve, fitting, or the exposed chrome rod.
5. Place it on clean padding, wood blocks, or another protected surface.
6. Cap the ports and wipe away exterior oil before transport to the bench.

PROTECT THE CHROME ROD

A scratch or impact mark on the polished rod can immediately damage the new rod seal. Never rest the rod on concrete, diamond plate, or bare steel.

4.9 Record Identification and Complete Removal

Before cleaning or disassembly, photograph the cylinder markings, valve-block orientation, port positions, mounting-eye direction, and gland position.



Figure 4-13. Cylinder identification markings.



Figure 4-14. Port and valve-block orientation.

Documented markings on the removed cylinder included T-88887 and 7911-001-09-10. Additional N and TN stamps were observed in other locations. Preserve these images with the repair record.

Removal Completion Checklist

- ☐ Boom remains securely supported
- ☐ Rod-end clevis pin and base/rear anchor pin retained
- ☐ Retaining plates and bolts stored together
- ☐ Hydraulic hoses marked and capped
- ☐ Cylinder ports capped
- ☐ Chrome rod protected
- ☐ Identification and orientation photographed
- ☐ All removed parts accounted for

CHAPTER SUMMARY

The cylinder is removed, protected, identified, and ready for bench disassembly. Proceed to Chapter 5 - Cylinder Disassembly.

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Chapter 5

Cylinder Disassembly

Revision A - Field-verified internal disassembly procedure



Figure 5-1. Rod, gland, and piston assembly being withdrawn from the cylinder barrel.

Chapter Objective

This chapter documents the internal disassembly of the Telsta A-28D elevation (lift) cylinder after it has been removed from the machine. The procedure preserves the orientation of the gland, piston, retaining nut, valve cartridge, and original seals so each component can be inspected and rebuilt correctly in later chapters.

CLEANLINESS WARNING

Internal cylinder components must be treated as precision hydraulic parts. Clean the exterior before opening the cylinder, keep the chrome rod off the ground, use wood or clean padding beneath parts, and cover every open port.

5.1 Disassembly Overview

Operation	Field requirement
Cylinder restraint	Secure the base end or mounting structure without crushing or distorting the barrel.
Gland lock	Remove the 7/64 in. locking set screw completely.
Gland removal	Use the 36 in. pipe wrench to break the gland loose and unthread it counterclockwise.
Rod assembly	Withdraw the rod, gland, and piston as one unit while supporting the polished rod.
Valve cartridge	Photograph, remove, cap, and protect the valve and bore.
Piston retention	Remove the 2 in. retaining nut counterclockwise on the documented cylinder.
Parts control	Keep every part in removal order; leave seals installed until orientation is recorded.

Disassembly Sequence

1. Clean the cylinder exterior and establish a protected drain/work area.
2. Photograph the gland, set screw, valve block, ports, piston end, and rod-end orientation.
3. Remove the gland locking set screw.
4. Loosen and unthread the gland from the barrel.
5. Withdraw the rod/gland/piston assembly in a straight line.
6. Remove and protect the cartridge valve as documented.
7. Support the rod assembly on wood blocks or clean padding.
8. Remove the 2 in. piston retaining nut, then slide the piston from the rod.
9. Protect the rod threads and slide the gland from the rod.
10. Lay all components in order and retain every original seal for comparison.

FACTORY MANUAL BOUNDARY

The Telsta service manual provides the elevation-cylinder removal procedure and identifies packing kit T-76349, but it does not provide a detailed internal rebuild sequence. The following procedure is based on the documented successful field rebuild.

5.2 Prepare the Cylinder and Work Area

Before opening the cylinder, remove loose dirt, rust scale, and grease from the barrel, gland collar, valve block, fittings, and mounting eyes. Contamination that falls into the barrel during disassembly can damage the bore, seals, and valve cartridge.



Figure 5-2. Cylinder supported across a drain container with the principal hand tools nearby.



Figure 5-3. Removed cylinder before internal disassembly.

Procedure

1. Place a drain pan or clean bucket beneath the cylinder to catch residual ATF.
2. Position the cylinder horizontally with the base end securely restrained and the rod end supported.
3. Use wood blocks or soft protection wherever painted or machined surfaces contact the bench or support.
4. Remove external dirt around the gland threads, set screw, valve block, and ports before opening any component.
5. Arrange labeled trays for the set screw, valve cartridge, retaining nut, piston, gland, and seals.
6. Keep a camera or phone at the bench and photograph each component before it is moved.

DO NOT CLAMP HERE

Do not clamp the polished rod, barrel tube wall, gland sealing surface, valve cartridge, or hydraulic threads in bare vise jaws. Use the welded base structure or mounting eye with suitable protection.

5.3 Remove the Gland Locking Set Screw

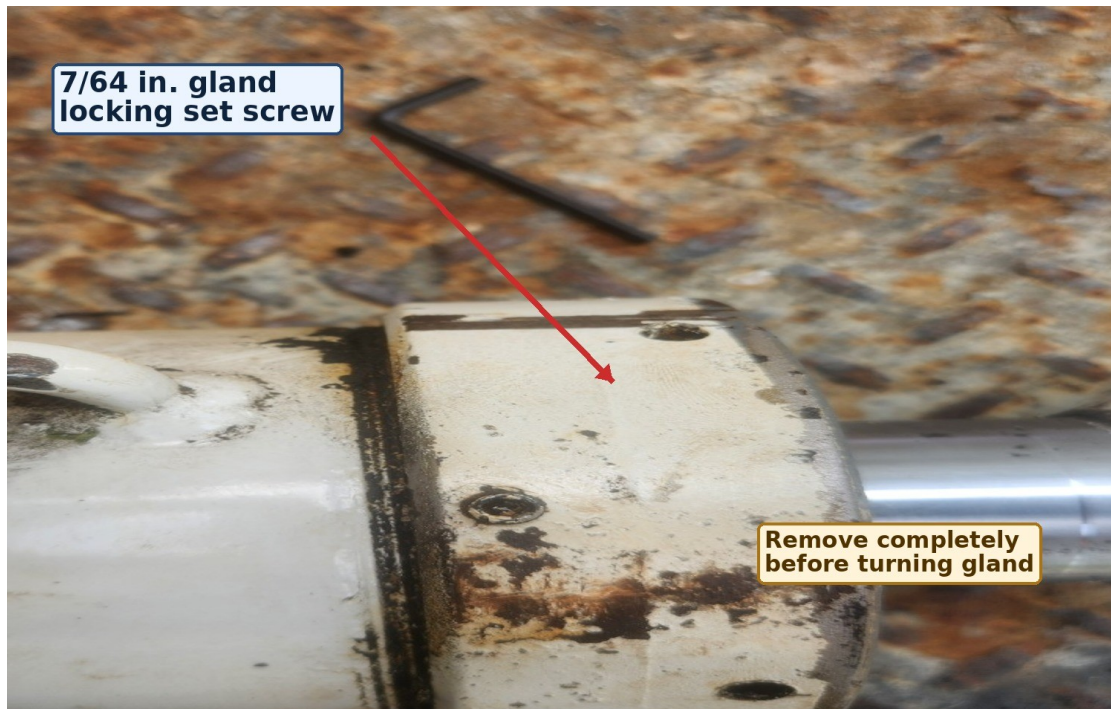


Figure 5-4. The 7/64 in. locking set screw must be removed before attempting to turn the gland.

Procedure

1. Clean the hex recess with a pick, brush, or compressed air so the key seats fully.
2. Insert a 7/64 in. hex key completely into the set screw.
3. Turn counterclockwise and remove the screw from the gland collar.
4. Place the screw in a labeled container; do not leave it partially threaded in the collar.
5. Inspect the screw tip and the gland locking point for burrs or mushrooming.

CRITICAL STEP

A partially engaged set screw can gouge the gland threads and greatly increase the force required to turn the gland. Confirm the hole is empty before applying the pipe wrench.

5.4 Loosen and Unthread the Gland

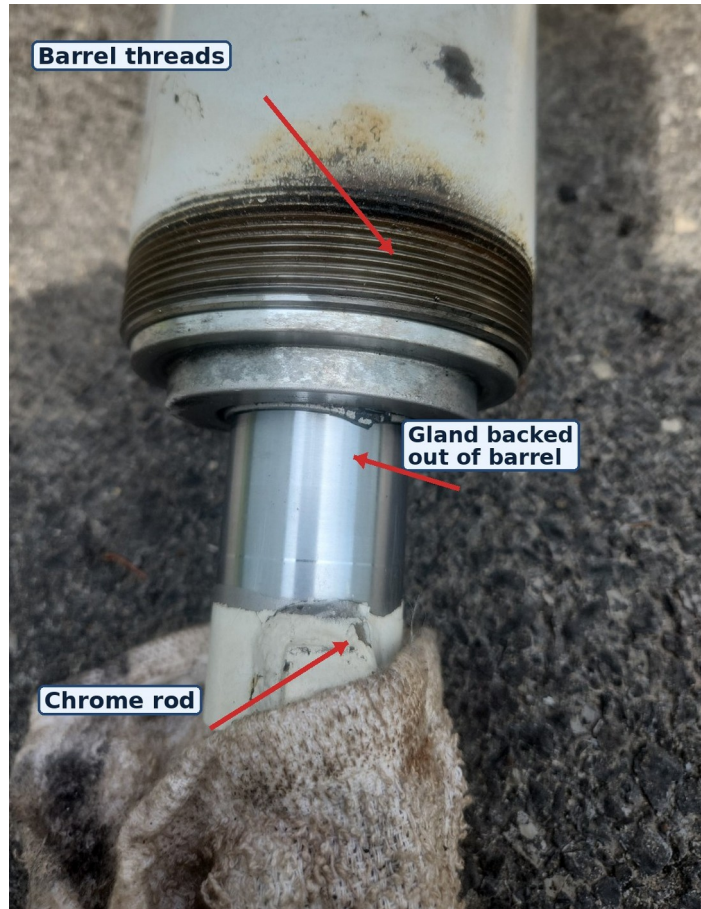


Figure 5-5. Gland backed out far enough to expose the barrel threads.

Procedure

1. Confirm the cylinder is restrained and the rod is supported in line with the barrel.
2. Place the 36 in. pipe wrench on the gland exterior where it will not contact the chrome rod.
3. Apply steady counterclockwise force to break the gland loose.
4. Once loose, continue turning the gland by hand whenever possible.
5. Watch for residual ATF as the sealing O-ring approaches the end of the barrel threads.
6. Unthread the gland completely but keep it centered on the rod.

NO VERIFIED GLAND TORQUE

No internal gland torque specification was located in the available A-28D service manual. Record the original position and thread engagement; do not invent a torque value for later reassembly.

PROTECT THE BARREL

Do not place the pipe wrench on the thin barrel tube. The wrench is used on the heavy gland collar only.

5.5 Withdraw the Rod Assembly

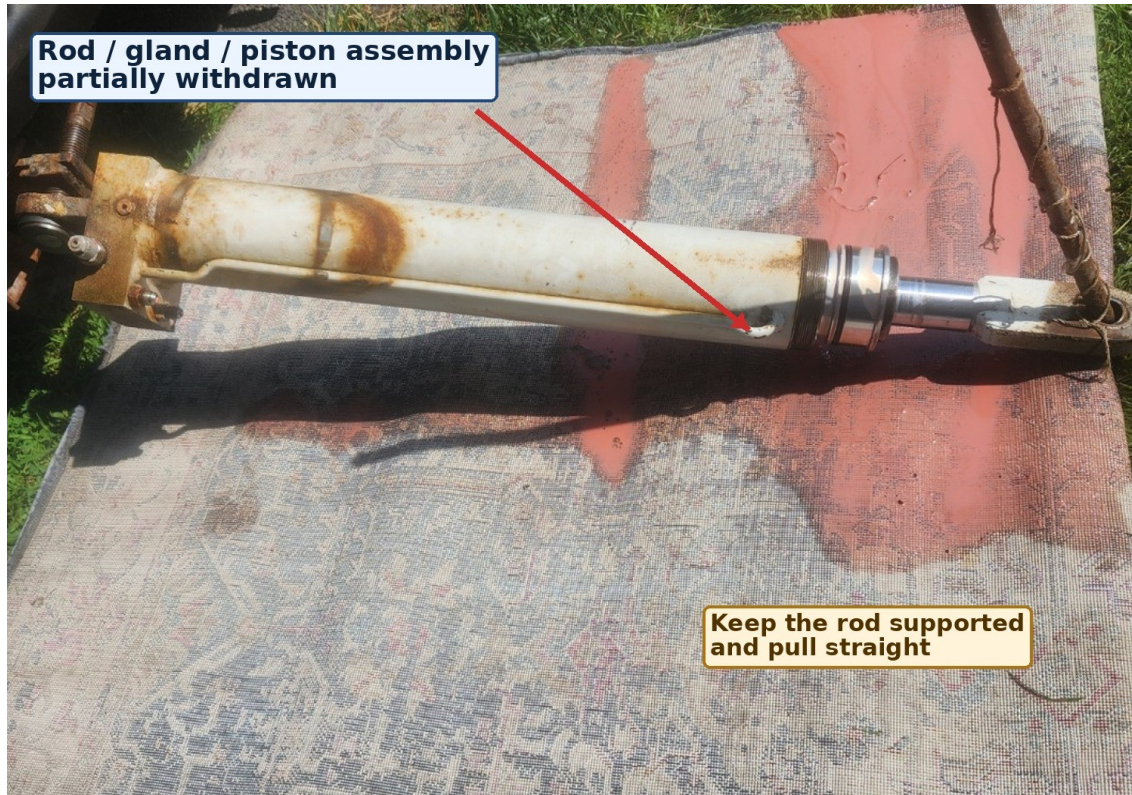


Figure 5-6. Rod, gland, and piston assembly being withdrawn from the barrel.

Procedure

1. Position a drain pan beneath the gland end and remove any temporary port caps needed to allow fluid and air movement.
2. Grip the rod-end eye or another non-polished surface. Do not grip the chrome rod with pliers or a vise.
3. Pull the assembly straight out while a second hand supports the rod and gland.
4. Expect resistance from the piston seals and hydraulic suction. Use a slow, steady pull rather than jerking.
5. As the piston reaches the barrel mouth, keep it square so the seal edges do not catch the threads.
6. Guide the complete rod/gland/piston assembly onto clean wood blocks or padded supports.
7. Allow residual ATF to drain into the pan and immediately protect the open barrel.

DO NOT PRY ON CHROME

Never use a screwdriver, pry bar, chain, or gripping tool against the polished rod surface. Any scratch in the seal travel area can cause repeat leakage.

5.6 Identify the Assembly Before Separating Parts



Figure 5-7. Major components on the extracted rod assembly.

Before removing the piston nut, photograph both ends and note the order and direction of every component. The piston is retained on the threaded end of the rod. The gland remains trapped on the rod until the piston is removed.



Figure 5-8. Gland at the rod-end eye.



Figure 5-9. Piston at the threaded rod end.

Orientation Record

- ☐ Piston seal and wear-ring positions photographed
- ☐ Piston face toward retaining nut photographed
- ☐ Retaining-nut flange and markings photographed
- ☐ Gland exterior and barrel-thread direction photographed
- ☐ Rod-end eye and gland direction photographed
- ☐ All visible seal lips photographed before removal

STOP POINT

Do not remove or discard original seals yet. Their profiles, colors, locations, and pressure-facing lips are the most reliable comparison for the replacement kit.

5.7 Remove and Protect the Cartridge Valve

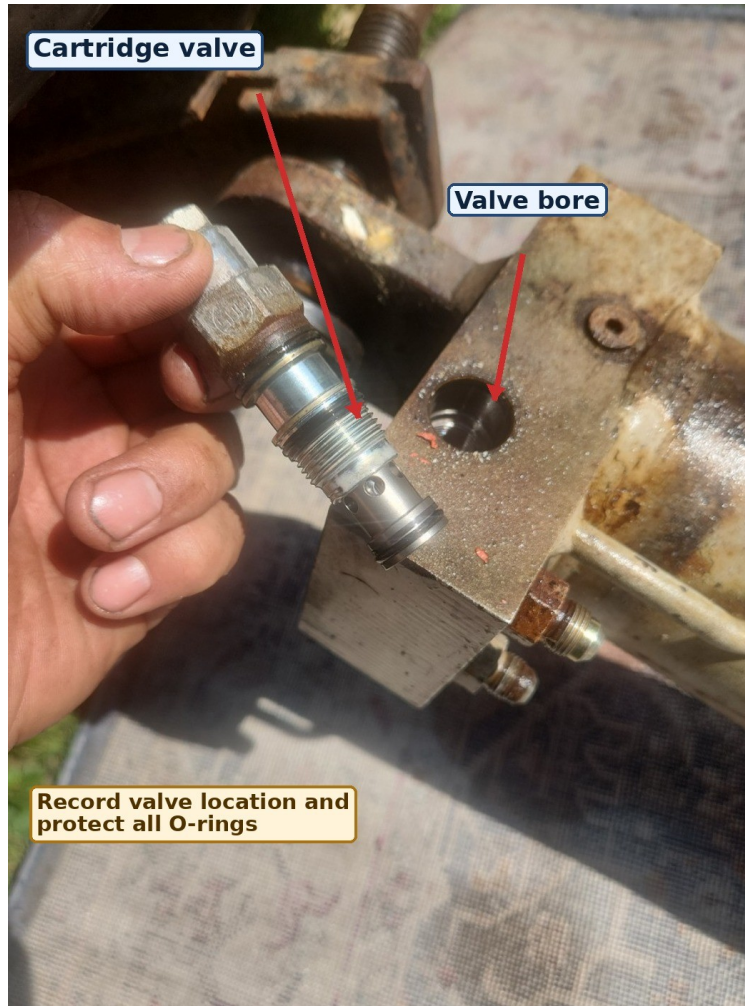


Figure 5-10. Cartridge valve removed from the cylinder valve block.

Procedure

1. Photograph the cartridge, electrical connection if equipped, and the exact valve-block bore from which it is removed.
2. Clean around the cartridge hex and surrounding block.
3. Use the correct wrench on the cartridge hex and turn counterclockwise.
4. Withdraw the cartridge straight out to avoid cutting its O-rings on the bore edge.
5. Inspect only for obvious damage at this stage; detailed inspection occurs in Chapter 6.
6. Wrap the cartridge in a clean lint-free cloth or sealed bag and cap the open bore.

VALVE IDENTIFICATION

The A-28D uses elevation-cylinder holding/emergency-lowering valve cartridges. Keep each cartridge matched to its original bore and orientation. Do not interchange them.

FACTORY INSTALLATION REFERENCE

The factory manual specifies lubricating the cartridge O-ring and approximately 30 ft-lb during installation. That value will be applied in the reassembly chapter, not during disassembly.

5.8 Remove the Piston Retaining Nut

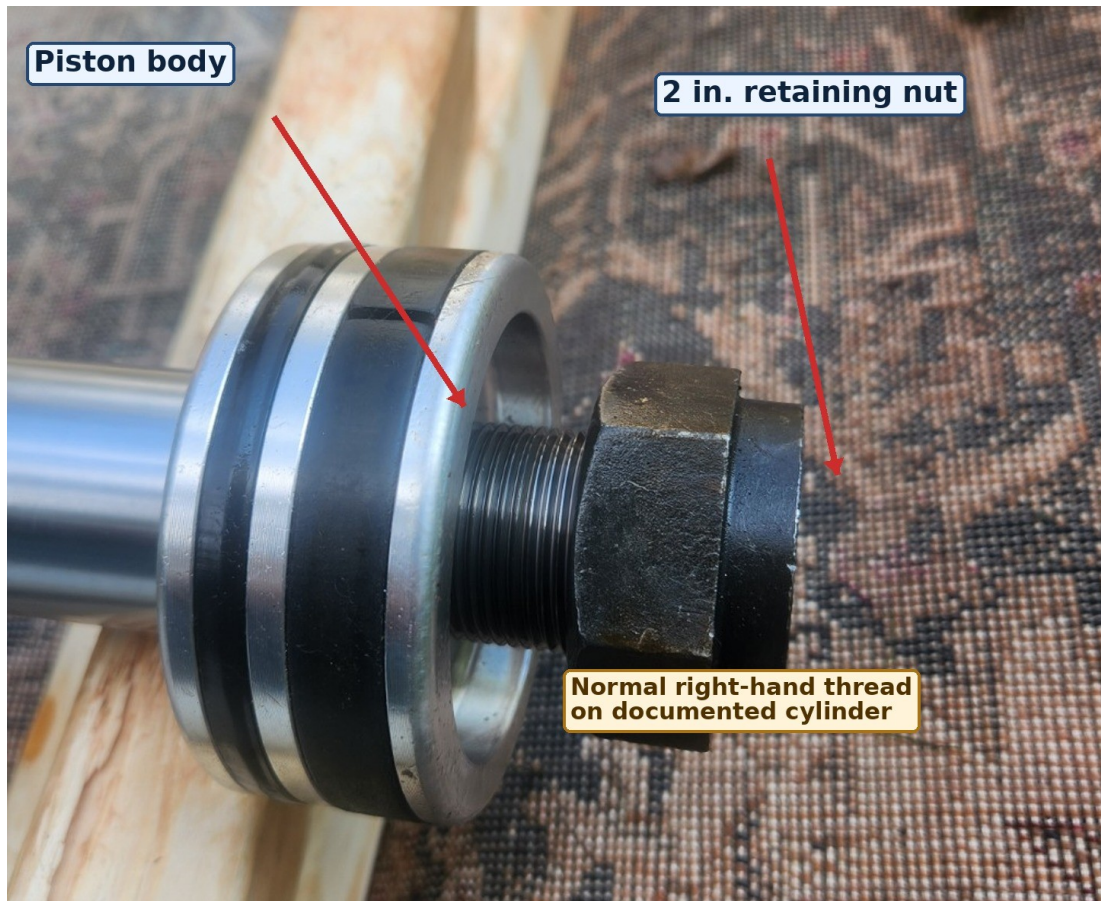


Figure 5-11. Piston retained by the 2 in. nut on the threaded rod end.

Procedure

1. Lay the rod assembly on wood blocks so the polished rod is fully supported and cannot roll.
2. Restrain the rod-end eye or another non-polished structural surface. Never clamp the chrome rod.
3. Place a 2 in. box-end wrench fully over the retaining nut.
4. Turn the nut counterclockwise. The documented cylinder used a normal right-hand thread.
5. Once loose, spin the nut off by hand while supporting the piston.
6. Photograph the nut face, flange, and the first exposed rod threads before moving the piston.
7. Place the nut in a labeled tray with its original outward-facing side identified.

ABNORMAL RESISTANCE

If the nut does not move with reasonable force, stop and inspect for thread damage, staking, corrosion, or a locking feature. Do not assume every replacement cylinder is identical.

5.9 Remove the Piston and Gland from the Rod

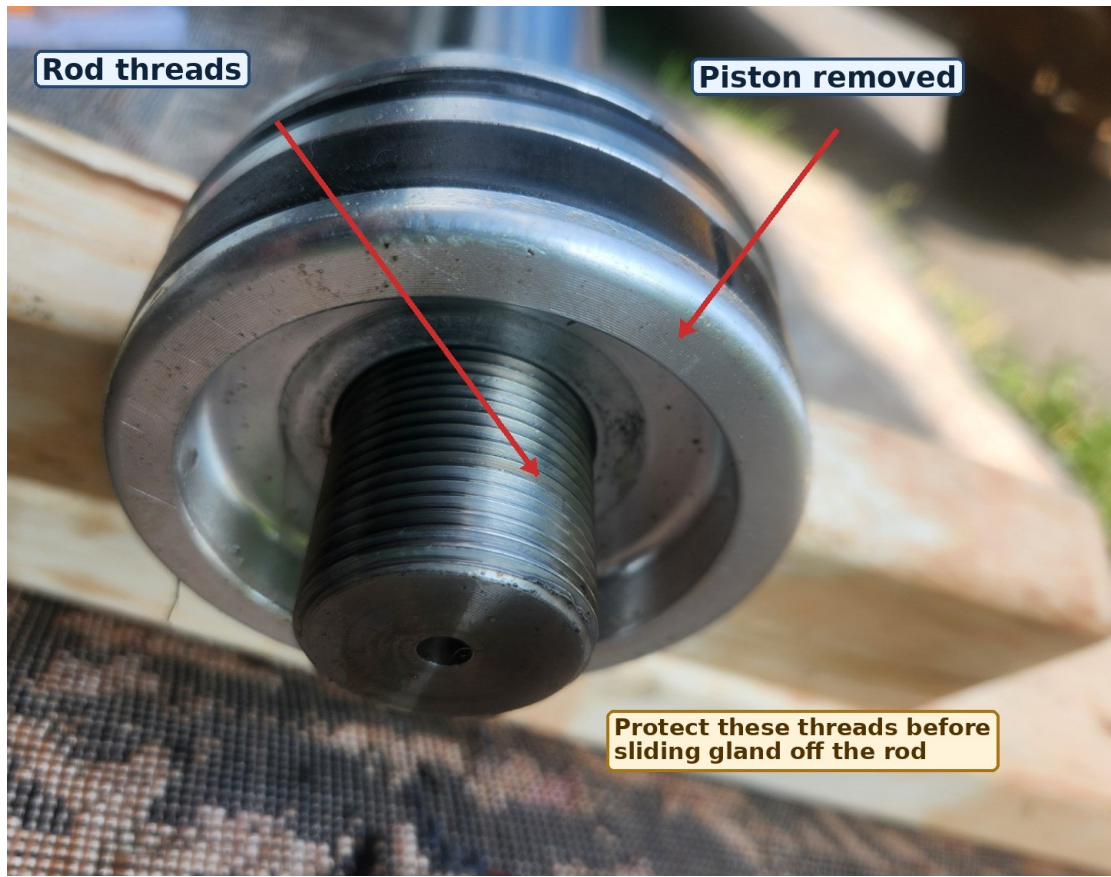


Figure 5-12. Threaded rod end after the retaining nut and piston have been removed.

Procedure

1. Slide the piston straight off the threaded rod end. Support its weight so it does not drop onto the rod threads.
2. Place the piston on a clean surface with its original orientation preserved.
3. Inspect the exposed threads for sharp edges, burrs, or corrosion.
4. Wrap the threads smoothly with masking tape before the gland is moved over them.
5. Lubricate the tape lightly with clean ATF if the gland is tight on the rod.
6. Slide the gland off the threaded end without allowing its internal rod seal to scrape bare threads.
7. Remove the protective tape and retain the gland, piston, and nut in assembly order.

FIELD-PROVEN THREAD PROTECTION

Masking tape over the rod threads prevents the old rod seal from being cut during removal and will be essential when the rebuilt gland is installed later. Cover every sharp thread crest with a smooth, wrinkle-free layer.

5.10 Parts Control and Disassembly Completion

At the end of Chapter 5, the metal components are separated but the original seals should remain installed wherever possible. This preserves the exact seal-stack arrangement for inspection and identification.

Component	Required condition
Barrel	Open ends protected; residual fluid drained; bore not yet aggressively cleaned.
Chrome rod	Supported on clean wood or padding; threads protected; no gripping marks.
Gland	Removed from rod; outer O-ring and backup ring still documented.
Piston	Removed from rod; piston seal and wear components still documented.
Retaining nut	Marked for outward-facing orientation and stored with piston.
Valve cartridge	Bagged or wrapped clean; matched to original bore.
Set screw	Stored separately and labeled.
Original seals	Not discarded; retained for measurement and replacement comparison.

Disassembly Completion Checklist

- ☐ Cylinder exterior cleaned before opening
- ☐ Gland locking set screw removed and retained
- ☐ Gland unthreaded without barrel damage
- ☐ Rod/gland/piston assembly removed straight
- ☐ Valve cartridge photographed and protected
- ☐ 2 in. retaining nut orientation recorded
- ☐ Piston and gland removed from rod
- ☐ Rod threads protected during gland removal
- ☐ Original seals retained in order
- ☐ All open ports and the barrel protected

CHAPTER SUMMARY

The elevation cylinder is now separated into its major service components with the original seal arrangement preserved. Proceed to Chapter 6 - Inspection and Damage Assessment.

BTM-001

Chapter 6

Component Inspection

Revision C - Small direct photo labels; arrows intentionally omitted for field placement



Figure 6-1. Complete rod assembly with compact labels placed clear of the inspection zones.

Chapter Objective

This chapter establishes a repeatable inspection process for the Telsta A-28D elevation (lift) cylinder after disassembly. The goal is to separate reusable hard parts from components that require seal replacement, repair, machining, or complete replacement before reassembly.

INSPECTION LIMIT

The Telsta service manual identifies elevation cylinder assembly T-74446 and packing kit T-76349, but no internal wear limits or dimensional service tolerances were found for the rod, bore, piston, gland, or mounting bushings. Do not invent tolerances. When visual and tactile checks are inconclusive, have a hydraulic machine shop measure the component.

6.1 Inspection Overview

Component	Inspection focus
Chrome rod	Check the full stroke area for scoring, pitting, rust, flaking chrome, impact dents, and straightness.
Rod threads	Check thread crests, roots, shoulder, and O-ring groove for burrs or deformation.
Gland	Inspect the rod bore, seal grooves, outer O-ring groove, threads, set-screw point, and entry chamfers.
Piston	Inspect sealing grooves, lands, edges, rod bore, nut seat, and all surfaces that contact the cylinder bore.
Cylinder barrel	Inspect the entire 3.500 in. bore, entry chamfer, internal surface, gland threads, ports, and valve block.
Valve cartridge	Check threads, O-rings, screen/orifices, tip, and bore for debris or damage.
Pins and bushings	Check for grooves, taper, corrosion, ovality, looseness, and damaged retaining hardware.
Original seals	Record profile, location, orientation, damage, hardening, cuts, flattening, and missing fragments.

Documented Rebuild Result

The documented cylinder was judged serviceable for resealing. The 1.750 in. chrome rod, 3.500 in. bore, gland, piston, cartridge valve, and mounting structure were reused. The original packing showed visible deterioration and was replaced as a complete matched set. After reassembly, installation, cycling, and leak inspection, the cylinder returned to service successfully.

DO NOT SKIP FULL INSPECTION
A leaking cylinder may have more than one cause. Replacing seals without inspecting chrome, bore, grooves, threads, and mounting alignment can destroy the new seals immediately.

6.2 Clean Before Judging Condition

Oil film, rust staining, old grease, paint, and seal residue can hide defects. Clean each component before deciding whether it is reusable, but do not use an abrasive process that changes dimensions or rounds sealing edges.

1. Wipe all parts with lint-free towels and a compatible cleaning solvent.
2. Use a soft nylon or brass brush on threads and non-sealing exterior surfaces.
3. Remove packed seal debris from grooves with a plastic pick or a dull, polished tool.
4. Flush the cartridge valve bore and hydraulic ports; do not force debris farther into passages.
5. Dry parts with clean compressed air at low pressure or allow them to air dry.
6. Apply a light film of clean Dexron-compatible ATF to polished surfaces after inspection to prevent flash rust.

ABRASIVE RESTRICTION

Cloth emery was used on the removable mounting pins, not on the chrome rod, cylinder bore, gland bore, piston lands, or seal grooves. Do not polish precision hydraulic surfaces casually.

Inspection Methods

Method	Use
Bright light	Move a strong light at a low angle to reveal scoring and chrome defects.
Clean fingernail	Drag lightly across a questionable mark. A groove that catches is more serious than discoloration.
White lint-free cloth	Wipe the bore and grooves; dark metal particles or seal fragments indicate additional cleaning is required.
Straightedge / V-blocks	Use when a bent rod is suspected. A hydraulic shop can check runout accurately.
Calipers / micrometer	Confirm known dimensions and identify obvious wear, but use a machine shop for precision service decisions.

6.3 Inspect the Chrome Rod



Figure 6-2. Compact labels are placed directly on open areas of the photograph, leaving room for field-added arrows.

1. Clean the rod and rotate it slowly under bright light.
2. Inspect the full working stroke for longitudinal scores, pits, rust, impact dents, and chrome peeling.
3. Run a clean fingernail lightly across every questionable line.
4. Inspect the transition from chrome to the threaded end and the area immediately beside the gland.
5. Check for a bent rod using V-blocks and a dial indicator when binding, uneven seal wear, or side loading is suspected.
6. Protect the rod immediately after inspection with clean padding and a light ATF film.

ACCEPT / REJECT GUIDE

Light visual polish marks that cannot be felt may be serviceable. Deep scoring, sharp pits, flaking chrome, rust craters, or a bent rod can cut a new rod seal and require professional repair or rod replacement.

6.4 Inspect Rod Threads, Shoulder, and O-Ring Groove



Figure 6-3. Rod threads and O-ring groove with compact labels positioned away from the indicated features.

1. Clean the threads completely and inspect every crest and root.
2. Confirm the retaining nut threads on by hand without binding or cross-threading.
3. Remove only raised burrs that could cut the O-ring or prevent the piston from seating; do not reshape the thread.
4. Inspect the shoulder and nut seating face for impact marks or mushrooming.
5. Inspect the small O-ring groove for sharp edges, corrosion, packed debris, and scratches.
6. Plan to cover the threads with masking tape before any new seal or gland passes over them.

DOCUMENTED CONDITION

The documented rod threads and small O-ring groove were reusable after cleaning. The masking-tape thread protector was retained as a required reassembly technique.

6.5 Inspect the Gland and Identify Seal Failure



Figure 6-4. Original gland packing area with compact direct labels.



Figure 6-5. Removed packing fragments retained for profile comparison.

6.5.1 Gland Inspection Procedure

1. Remove all old seals only after photographing their location and orientation.
2. Clean the rod bore, internal seal grooves, outer O-ring groove, entry chamfer, and gland threads.
3. Inspect the machined rod bore for scoring, galling, corrosion, and embedded debris.
4. Inspect every groove edge for burrs that could shave the new seal during installation.
5. Check the gland threads and the 7/64 in. locking-screw contact point for damage.
6. Confirm the wiper counterbore and internal seal groove are clean and undistorted.

CONFIRMED FAILURE EVIDENCE

The documented gland contained torn and fragmented sealing material. This visible damage justified replacement of the complete packing set rather than replacing only the externally visible seal.

Inspection Notes

Preserve the removed pieces until the new packing kit has been matched by profile, thickness, diameter, and installation location. Small fragments can reveal the original lip direction or the presence of a backup element that might otherwise be overlooked.

6.6 Inspect the Piston and Seal Grooves



Figure 6-6. Piston land and sealing groove with labels placed in open image areas.

1. Clean the piston body, rod bore, nut seat, and all seal or wear-ring grooves.
2. Inspect the cylindrical lands for scoring, galling, impact dents, or raised aluminum.
3. Check groove edges for burrs and confirm no old seal fragments remain packed in the corners.
4. Inspect the rod bore and seating faces for fretting or looseness.
5. Confirm the retaining nut seats fully and the piston is not cracked or distorted.
6. Replace every piston sealing element and wear component included in the matched kit, even if an old piece appears usable.

DOCUMENTED CONDITION

The piston body and grooves were reused. No photographed defect required piston replacement, but the old sealing elements were not reused.

6.7 Inspect the Barrel, Bore, Threads, and Ports



Figure 6-7. Barrel entry, gland threads, and gland exterior during disassembly.

1. Illuminate the full 3.500 in. bore with a bright light and inspect from both ends where possible.
2. Look for long scoring lines, rust, pitting, metal transfer, impact dents, or a ridge at the end of travel.
3. Wipe the bore with a clean white cloth and repeat until no debris or seal fragments remain.
4. Inspect the barrel entry chamfer for sharp damage that could cut the piston seal during insertion.
5. Inspect the gland threads for pulled metal, cross-threading, and damage from the locking screw.
6. Inspect hydraulic ports, the valve block, and fitting seats for contamination, cracks, or damaged threads.

BORE DECISION

A bore mark that catches a fingernail, visible pitting in the sealing path, or an out-of-round barrel requires professional evaluation. The documented barrel was reused and passed the post-rebuild functional and leak test.

6.8 Inspect the Cartridge Valve



Figure 6-8. Cartridge valve and bore with small labels placed away from the working features.

1. Inspect the cartridge threads, O-rings, tip, screen, and visible orifices for damage or debris.
2. Do not scratch the valve bore or use wire that can enlarge a calibrated opening.
3. Keep the valve capped and oriented until reinstallation.
4. Replace damaged valve O-rings with exact matches; replace the valve if its working surfaces are damaged or contaminated beyond cleaning.

CLEANLINESS REQUIREMENT

Keep the valve matched to its original bore. Do not interchange cartridges, allow lint into the passages, or leave the open bore exposed during other work.

6.8.1 Inspect Mounting Pins, Eyes, and Bushings



Figure 6-9. Original mounting-pin condition before cleaning and lubrication.

1. Clean removable pins with penetrating oil and cloth emery, rotating the pin to avoid flat spots.
2. Inspect for grooves, taper, corrosion pits, mushroomed ends, and damaged retaining-plate contact areas.
3. Clean the cylinder-eye bushings and inspect for ovality, cracks, looseness, or missing material.
4. Test the cleaned pin in each bushing. Excessive looseness or visible rocking requires repair before returning the lift to service.
5. Inspect retaining plates and bolts for distortion, damaged threads, and secure fit.

6.9 Inspection Record and Serviceability Decision

Record item	Documented value / required entry
Rod diameter	1.750 in. measured on documented cylinder.
Cylinder bore	3.500 in. measured on documented cylinder.
Rod surface	Record visible marks, tactile findings, and any runout measurement.
Gland condition	Record bore, groove, thread, set-screw, and chamfer condition.
Piston condition	Record land, groove, bore, and nut-seat condition.
Barrel condition	Record bore, chamfer, thread, port, and valve-block condition.
Valve condition	Record O-ring, thread, screen/orifice, and bore cleanliness.
Mounting hardware	Record pin diameter condition, bushing fit, retaining plate, and bolt condition.
Seal failure	Photograph and retain every damaged original seal until the new kit is verified.

Final Inspection Checklist

- ☐ Chrome rod inspected over full stroke and protected.
- ☐ Rod threads, shoulder, and small O-ring groove accepted.
- ☐ Gland stripped, cleaned, and all grooves inspected.
- ☐ Piston stripped, cleaned, and grooves inspected.
- ☐ Cylinder bore and entry chamfer inspected under bright light.
- ☐ Barrel and gland threads accepted.
- ☐ Cartridge valve and bore clean and protected.
- ☐ Pins, bushings, retaining plates, and bolts inspected.
- ☐ Original seal profiles photographed and retained.
- ☐ All questionable hard-part defects referred for professional measurement.

PROCEED TO CHAPTER 7

Once every hard part is accepted and the original seals are documented, proceed to Chapter 7: Seal Identification and Replacement Kit Verification. Do not discard the original seals until every replacement has been matched by location, size, and profile.

BTM-001

Chapter 7

Seal Identification and Replacement Kit Verification

Revision A - Small direct photo labels; arrows intentionally omitted for field placement



Figure 7-1. The four gland-related replacement elements laid out beside the gland body.

Chapter Objective

This chapter identifies the seven replacement sealing elements used in the documented Telsta A-28D elevation-cylinder rebuild, establishes a method for verifying a replacement kit against the original parts, and records the correct location and handling of each seal before final rod and barrel reassembly.

VERIFICATION RULE

Do not identify hydraulic seals by color alone. Match every replacement by part code when available, measured size, cross-section, profile, groove location, and the orientation recorded during disassembly.

7.1 Factory Packing Kit and Matched Replacement Set

The Telsta parts list identifies elevation cylinder assembly T-74446 and packing kit T-76349 on factory manual Page -67-. The factory parts page does not individually identify the internal seals. For the documented rebuild, Nu-Way Hydraulics matched the removed components and supplied the individual replacement elements shown below.

Code	Description	Location / function
DRTU25-1.75-337	Rod U-seal	Internal gland pressure seal for the 1.750 in. chrome rod.
ST-175	Wiper	Outermost gland seal; excludes dirt, water, and debris from the rod bore.
612-350-050	Wear ring	Wide piston bearing band that supports the piston in the 3.500 in. bore.
PSI-3538	Piston seal	Pressure-sealing element between the piston and cylinder bore.
OR236	O-ring	Static external gland seal between gland body and cylinder barrel.
BU236	Back-up ring	Supports the gland O-ring against extrusion under pressure.
OR020	020 O-ring	Small static O-ring installed in the rod-end groove beneath the piston/spacer stack.

APPLICABILITY

This list documents the exact set used successfully in this cylinder. Do not assume every previously repaired or replacement cylinder contains the same internal parts. Verify the cylinder measurements and removed profiles before ordering.

7.2 Nu-Way Invoice and Parts Verification Record

Nu-Way Hydraulics 5890 Fisher Road East Syracuse, NY 13057		Invoice															
<table border="1"> <tr> <td>DATE</td> <td>INVOICE #</td> </tr> <tr> <td>7/13/2026</td> <td>203047</td> </tr> </table>		DATE	INVOICE #	7/13/2026	203047												
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P.O. NUMBER	TERMS	SALES ...	ORDER DA...	VIA	ORDERED BY	OUR ORDER NUMBER											
	Due on rec...	JOE	7/13/2026	CPU		NONE											
QUANTITY	B/O	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT												
1		DRTU25-1.75-37	ROD U-SEAL	21.60801	21.61T												
1		ST-175	WIPER	6.68927	6.69T												
1		612-350-050	WEAR RING	11.73322	11.73T												
1		PSC-338	PISTON SEAL	24.35553	24.36T												
1		OR236	ORING	2.35	2.35T												
1		BU236	BACK-UP RING	2.08553	2.09T												
1		OR020	020 ORING	1.20	1.20T												
				Subtotal	\$70.03												
				Sales Tax (8.0%)	\$5.60												
				Total	\$75.63												
<table border="1"> <tr> <td>Phone #</td> <td>Fax #</td> </tr> <tr> <td>(315)-437-7307</td> <td>(315)-437-7520</td> </tr> </table>		Phone #	Fax #	(315)-437-7307	(315)-437-7520												
Phone #	Fax #																
(315)-437-7307	(315)-437-7520																

Figure 7-2. Nu-Way Hydraulics invoice 203047 dated July 13, 2026, documenting the matched seal components used in the rebuild.

Retain the invoice or packing list with the service records. It provides a repeatable reference for future maintenance and helps prevent substitution based only on appearance.

Verification Procedure

1. Lay the original parts and replacements on clean white paper in their installed groups: gland internal, gland external, piston, and rod-end O-ring.
2. Compare inside diameter, outside diameter, thickness, split or solid construction, lip profile, and material stiffness.
3. Confirm each replacement fits its intended groove without stretching excessively or standing proud of the machined land.
4. Photograph the final matched layout and record all visible molded markings or supplier codes.
5. Keep the original pieces until the cylinder has passed its full-stroke leak test.

7.3 Seal Map and Function

Seal	Function and location
Rod U-seal	Dynamic pressure seal inside the gland. Its open pressure lip faces inward toward cylinder pressure; the smooth back faces toward the wiper.
Wiper	Dynamic exclusion seal at the exposed end of the gland. The scraping lip faces outward toward the environment.
Gland O-ring	Static seal on the gland exterior that prevents oil bypass around the gland threads/body.
Gland back-up ring	Anti-extrusion support installed beside the gland O-ring in the documented relationship.
Piston seal	Dynamic seal that separates the two hydraulic chambers as the piston moves through the bore.
Wear ring	Bearing surface that keeps the piston centered and limits metal-to-metal contact.
Small rod O-ring	Static seal at the rod-end shoulder under the piston/spacer assembly.

Orientation Rule

Lip seals have a pressure direction; O-rings do not. Before removing an original lip seal, photograph which side faced the cylinder interior. If the original is too damaged to read, use the groove geometry, replacement profile, and supplier guidance rather than guessing.

COLOR IS NOT A SPECIFICATION

Blue, yellow, orange, and black were the colors supplied for this rebuild. Color may change with manufacturer, material, or production batch. Always rely on profile and part identification.

7.4 Original Packing Failure and Complete Replacement



Figure 7-3. Original packing removed from the gland. The broken pieces were retained to verify profile and location.



Figure 7-4. Close view of the fractured original lip-seal material.

The original packing was visibly torn and fragmented. Because fragments can conceal missing backup elements and because aged seals often harden as a group, the documented rebuild replaced the complete matched set rather than only the most visibly damaged piece.

DO NOT REUSE REMOVED SEALS

A seal may look serviceable after removal but can be permanently stretched, nicked, flattened, or hardened. Once the cylinder is disassembled for leakage, replace the complete matched packing set.

7.5 Rod U-Seal and Wiper Identification



Figure 7-5. DRTU25 rod U-seal at the gland before installation.



Figure 7-6. U-seal profile; open lip is pressure-energized.

Installation Preparation

1. Clean the internal gland grooves until no old packing, rust, or sharp residue remains.
2. Coat the seal and groove with clean Dexron-compatible ATF.
3. Confirm the U-seal open lip will face inward toward the hydraulic pressure side.
4. Inspect the yellow wiper and confirm its scraping lip will face outward toward the exposed rod.
5. Use fingers only. Do not use screwdrivers, hooks, picks, or sharp seal tools on the sealing lips.

PROFILE CHECK

Before folding the seal into the gland, compare the molded lip shape to the removed seal and the pressure direction recorded during disassembly.

7.5.1 Install the Rod U-Seal and Wiper

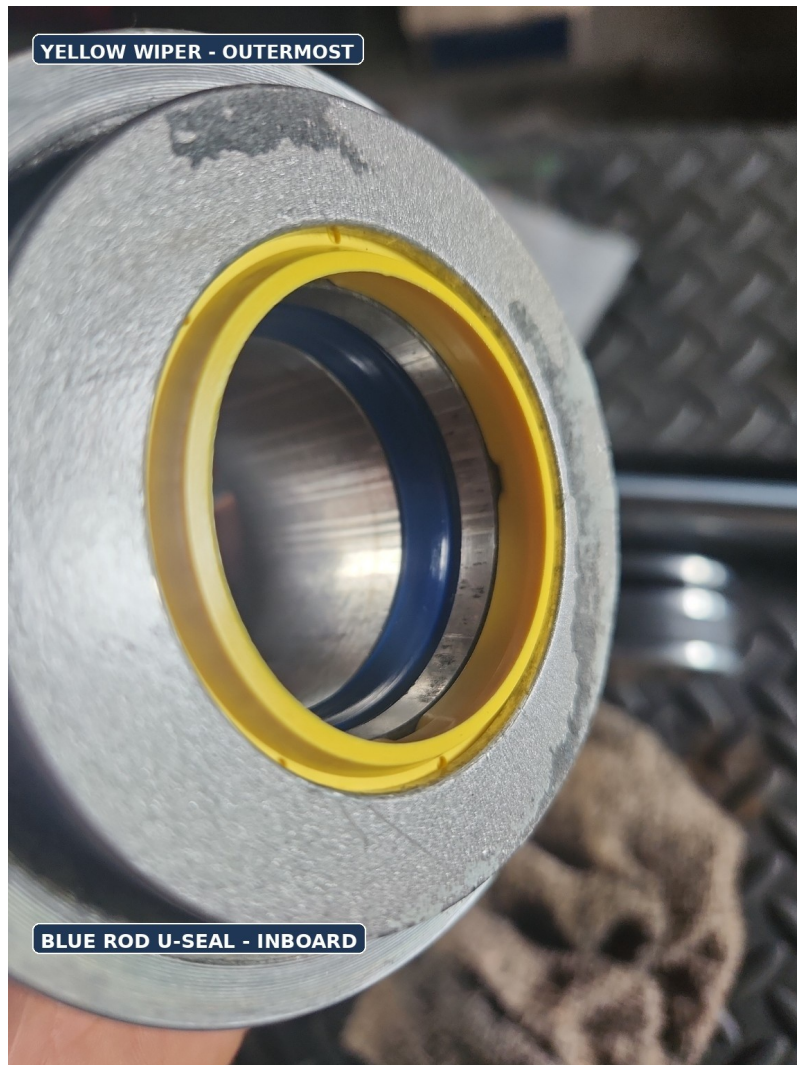


Figure 7-7. Completed gland interior showing the yellow wiper outside and blue rod U-seal behind it.

1. Compress the blue U-seal slightly and place one section into the clean internal groove.
2. Hold the seated section with a thumb and work the remainder into the groove a small section at a time.
3. Expect the final section to feel tight. Continue with firm finger pressure until the last raised section pops fully into the groove.
4. Run a clean fingertip around the complete circumference to confirm the seal is not twisted and no lip is trapped.
5. Install the yellow wiper by the same gradual finger method with the scraping lip facing outward.
6. Inspect both seals from the rod opening. They must be fully seated, concentric, clean, and free of cuts.

MECHANIC'S TIP

The rod U-seal felt extremely tight until roughly 90 percent installed. The final section seated with continued finger pressure; no sharp tool was required.

7.6 Install the External Gland O-Ring and Back-Up Ring



Figure 7-8. Completed gland showing the orange BU236 back-up ring and black OR236 O-ring in the external groove.

1. Clean the external gland groove and inspect both groove edges for burrs.
2. Lubricate the OR236 O-ring and BU236 back-up ring with clean ATF.
3. Install the split back-up ring without overlapping its ends or twisting it.
4. Install the O-ring beside the back-up ring in the same relationship documented during removal and shown in the completed gland photograph.
5. Rotate the O-ring gently in the groove to remove any twist. Do not roll it into a spiral.
6. Confirm neither element protrudes above the gland land where it can be shaved by the barrel entry.

ORIENTATION CAUTION

The back-up ring supports the O-ring on the extrusion side. If the original relationship is unknown or the groove differs from the documented gland, stop and confirm orientation with the seal supplier.

7.7 Piston Seal and Wear Ring



Figure 7-9. Piston with the wide wear element and piston-seal energizer shown for matching.



Figure 7-10. Piston after installation of the wide wear ring and two-piece piston seal.

The wear ring is a bearing element, not the pressure seal. The piston seal is the element that separates the extend and retract chambers. Keep their grooves and functions distinct during installation.

7.7.1 Install the Piston Elements

- 1. Clean both piston grooves and coat the replacement parts with clean ATF.
- 2. Install the piston-seal O-ring energizer in its groove without twist.
- 3. Install the outer piston sealing element over the energizer. Work it evenly around the piston rather than stretching one spot excessively.
- 4. Install the wide wear ring in the bearing groove. If it is split, place the ends together without overlap.
- 5. Allow stretched elements to relax, then inspect the full circumference for high spots, twists, cuts, or trapped edges.
- 6. Test-fit visually against the cylinder entry chamfer. The piston must enter squarely during Chapter 8; do not force a proud or damaged seal into the bore.

NO DRY FITTING

Clean ATF is both the assembly lubricant and the initial protective film. Dry seals can drag, twist, or tear before hydraulic oil reaches them.

Reject Before Assembly

Condition	Required action
Cut or shaved edge	Replace the affected seal; do not attempt to smooth it.
Twisted O-ring	Remove, inspect, relubricate, and reinstall without spiral twist.
Split wear ring overlap	Reposition so the ends meet without stacking.
Seal stands proud	Confirm correct groove, size, and energizer placement before proceeding.
Unknown orientation	Compare with removal photographs or contact the supplier.

7.8 Small Rod O-Ring Identification



Figure 7-11. OR020 replacement and its rod groove.



Figure 7-12. OR020 installed at the rod shoulder.

1. Inspect and clean the small rod groove immediately behind the threaded end.
2. Lubricate the OR020 O-ring and ease it into the groove without dragging it across sharp threads.
3. Confirm the O-ring is fully seated and not rolled into a spiral.

STATIC SEAL LOCATION

The OR020 seals the rod-end shoulder beneath the piston/spacer stack. It must remain seated while the other components are moved over the threaded end.

7.8.1 Protect the Rod Threads



Figure 7-13. Smooth masking-tape sleeve covering the complete threaded end while leaving the OR020 visible for inspection.

1. Wrap the complete threaded section with smooth masking tape before the gland, piston, spacer, or any new seal passes over it.
2. Overlap the tape enough to cover every thread crest, but do not create a thick ridge at the rod shoulder.
3. Lubricate the tape lightly with clean ATF so seals slide over it without dragging.
4. Keep the OR020 visible and verify it does not climb out of its groove as parts pass the shoulder.
5. Remove the tape only after all vulnerable seals and components have cleared the threads.
6. Inspect the OR020 and every passing seal once more before final piston/spacer assembly.

THREAD PROTECTION IS REQUIRED

The rod threads can slice a new O-ring or the gland seals instantly. The masking-tape sleeve used during this rebuild is a required field technique, not an optional convenience.

7.9 Final Seal Verification Record

Code	Description	Location / function
DRTU25-1.75-337	Rod U-seal	Installed in gland; open lip inward; no twist or damage.
ST-175	Wiper	Installed outermost; scraper lip outward; fully seated.
OR236	Gland O-ring	Installed in external gland groove; lubricated; not twisted.
BU236	Back-up ring	Installed beside OR236; ends not overlapped.
PSI-3538	Piston seal	Energizer and outer element fully seated; no high spots.
612-350-050	Wear ring	Installed in bearing groove; ends meet without overlap.
OR020	Small rod O-ring	Installed at rod shoulder; protected from threads.

Completion Checklist

- ☐ Original seals photographed and retained for comparison.
- ☐ Invoice and supplier part codes recorded.
- ☐ All grooves cleaned and inspected.
- ☐ Every new seal lubricated with clean ATF.
- ☐ Rod U-seal and wiper installed in correct directions.
- ☐ Gland O-ring and backup ring installed in verified relationship.
- ☐ Piston seal and wear ring installed in separate correct grooves.
- ☐ Small rod O-ring installed and protected from threads.
- ☐ No seal is cut, twisted, overlapped, dirty, or standing proud.
- ☐ Completed gland and piston photographed before reassembly.

PROCEED TO CHAPTER 8

With every sealing element identified, matched, lubricated, and installed, proceed to Chapter 8: Rod and Cylinder Reassembly. Keep the rod threads taped until all vulnerable parts have passed over them.

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Chapter 8

Cylinder Reassembly

Revision A - Small direct photo labels; arrows intentionally omitted for field placement



Figure 8-1. Completed rod assembly with the gland, chrome rod, and piston stack ready for insertion into the barrel.

Chapter Objective

This chapter provides the complete field-verified procedure for rebuilding the rod assembly and returning it to the Telsta A-28D elevation-cylinder barrel. It covers gland assembly, thread protection, small rod O-ring installation, piston and retaining-nut assembly, barrel preparation, piston insertion, gland seating, threaded retaining-cap installation, cartridge-valve installation, and final bench inspection.

CRITICAL ASSEMBLY RULE

Use only clean Dexron-compatible ATF as assembly lubricant. Keep every seal, machined groove, barrel entry, and section of chrome rod free from grit. Never use a sharp pick, screwdriver, or exposed metal edge to force a seal into place.

8.1 Reassembly Sequence and Work-Area Preparation

Complete the reassembly in the following order. This sequence keeps the sealing surfaces protected and prevents the piston or gland from being installed backward.

Stage	Required result
1. Verify parts	Confirm all seven replacement sealing elements are installed in the locations established in Chapter 7.
2. Complete gland	Install and verify the rod U-seal, wiper, external O-ring, and back-up ring.
3. Protect threads	Install the small rod O-ring, cover the rod threads with a smooth masking-tape sleeve, and slide the gland onto the rod.
4. Install piston	Ease the piston stack over the lubricated rod O-ring, install the retaining nut, and tighten it fully.
5. Prepare barrel	Clean and lubricate the bore entry; remove the cartridge valve so trapped air can move freely.
6. Insert rod assembly	Start the piston squarely, tap evenly with a rubber mallet as required, and push the assembly into the barrel.
7. Secure cylinder	Seat the gland, install and lock the threaded retaining cap, reinstall the cartridge valve, cap the ports, and complete the bench inspection.

Required Tools and Consumables

Item	Use
Clean Dexron-compatible ATF	Lubricates seals, rod, piston, valve O-rings, and bore entry.
Masking tape	Creates a smooth temporary sleeve over the rod threads.
Rubber mallet	Provides light, even force while starting the piston into the barrel.
2 in. box-end wrench	Installs and tightens the piston retaining nut.
36 in. pipe wrench	Threads and seats the gland-retaining cap only after it has been started correctly by hand.
7/64 in. hex key	Reinstalls the gland locking screw.
Clean lint-free towels	Protect parts and remove contamination without leaving fibers.

TORQUE INFORMATION

No verified piston-nut or gland-retaining-cap torque specification was located in the supplied Telsta service manual. The documented rebuild returned to service successfully by fully seating the original components using the original wrenching method and preserving the recorded orientation. Do not invent a torque value.

8.2 Complete and Verify the Gland Assembly

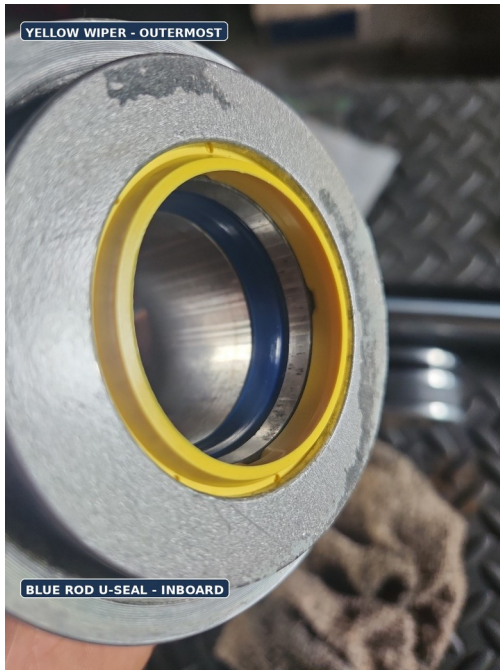


Figure 8-2. Internal gland seals: the wiper is outermost; the rod U-seal is inboard toward cylinder pressure.



Figure 8-3. Completed gland showing the exposed-end wiper and the external barrel-sealing pair.

Procedure

1. Clean the gland grooves and rod bore. Confirm that no fragments from the failed packing remain in the machined recesses.
2. Coat the replacement rod U-seal with clean ATF. Seat one section of the seal in its groove, then work it around by hand until the last raised section snaps fully into place.
3. Install the wiper at the exposed end of the gland with its scraping lip facing outward toward the environment.
4. Install the external OR236 O-ring and BU236 back-up ring in the same recorded order and orientation used during removal. Do not twist either ring.
5. Run a clean, lubricated finger around every installed seal. Each element must remain fully seated, even, and free of cuts.

MECHANIC'S TIP

The rod U-seal may feel extremely tight until approximately the final ten percent is seated. Continue working it by hand rather than reaching for a sharp tool. The last section should pop into the groove without cutting the seal.

8.3 Install the Small Rod O-Ring and Protect the Threads



Figure 8-4. The lubricated OR020 installed in the rod-end groove immediately above the threads.



Figure 8-5. A smooth masking-tape sleeve protects every new seal that must pass over the rod threads.

Procedure

1. Inspect the rod threads and the small O-ring groove. Remove burrs, rust, tape adhesive, or metal fragments before installing any new part.
2. Lightly coat the OR020 O-ring with clean ATF and install it in the rod groove. Confirm it is not rolled or twisted.
3. Wrap the threads with masking tape to form a smooth sleeve. Cover the crests and the sharp end of the threads while leaving the O-ring and shoulder visible.
4. Smooth the tape by hand so no folded edge can catch the gland U-seal or wiper.
5. Apply a light film of ATF to the tape sleeve, chrome rod, and gland bore immediately before sliding the gland into place.

DO NOT SKIP THIS STEP

The thread protector is inexpensive insurance. Passing the gland or piston seals over bare threads can slice a sealing lip that appears undamaged until the cylinder is pressurized.

8.4 Slide the Gland onto the Rod



Figure 8-6. Gland installed on the rod with the exposed-end wiper facing away from the piston and the external barrel seals still visible.

Procedure

1. Confirm the gland is facing the correct direction before it touches the rod: the wiper faces the exposed rod end; the pressure side of the rod U-seal faces inward toward the piston and cylinder barrel.
2. Hold the gland square to the taped rod threads. Do not allow the gland to cock sideways against the tape sleeve.
3. Rotate the gland slightly while sliding it over the protected threads and onto the chrome rod.
4. Continue past the thread protector until both the wiper and rod seal are fully on the smooth chrome surface.
5. Remove every piece of masking tape. Wipe the rod clean and inspect the seal lips for shaving, folding, or displacement.
6. Slide the gland several inches along the rod. Movement should be firm and smooth without a hard catch.

ORIENTATION CHECK

Once the piston retaining nut is installed, reversing the gland requires complete rod-end disassembly. Verify the wiper is toward the rod eye before proceeding.

8.5 Install the Piston and Retaining Nut

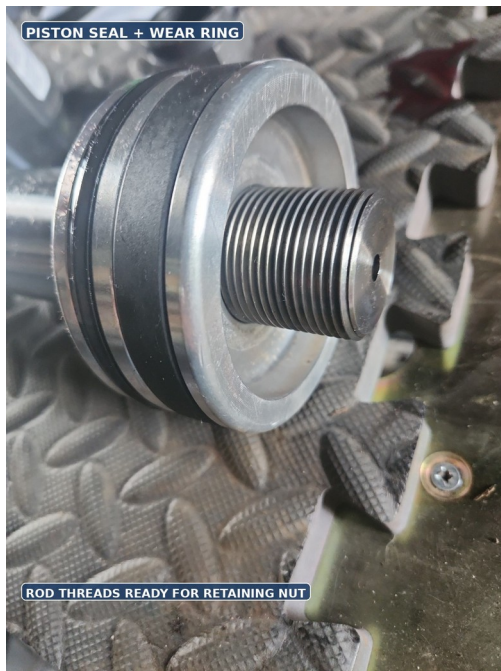


Figure 8-7. Piston stack seated on the threaded rod end before installation of the retaining nut.

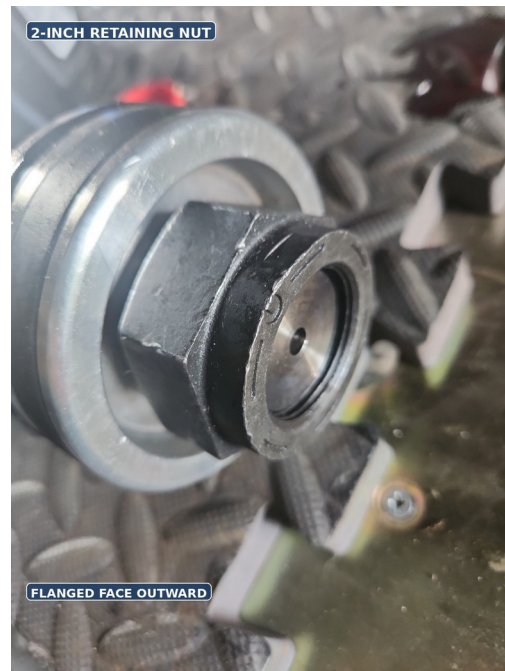


Figure 8-8. Original 2-inch retaining nut installed with the flanged face outward.

Procedure

1. Coat the small OR020 and the mating bore of the piston stack with clean ATF.
2. Align the piston stack squarely with the rod shoulder. Rotate the mating component while easing it over the lubricated O-ring; do not force it straight across the seal.
3. Push the piston fully against the rod shoulder. Confirm the small O-ring remains in its groove and was not shaved or displaced.
4. Install the original retaining nut with the flanged face outward, matching the documented disassembly orientation.
5. Thread the nut by hand until it seats. Tighten it fully with the 2-inch box-end wrench using the same controlled method used during removal.
6. Inspect the piston seal and wear ring after tightening. Both must remain centered, even, and undamaged.

NO UNVERIFIED TORQUE

The successful field rebuild used the original nut and a 2-inch box-end wrench because a suitable impact socket was not locally available. No verified torque value was found; do not substitute a guessed specification.

8.6 Inspect the Completed Rod Assembly



Figure 8-9. Completed rod assembly. The gland remains free on the chrome rod while the piston and retaining nut are secured at the threaded end.

Rod-Assembly Inspection

- ☐ All masking tape and adhesive have been removed.
- ☐ Chrome rod is clean and free of nicks, grit, or tool marks.
- ☐ Gland slides smoothly on the rod without binding.
- ☐ Wiper lip remains even around the rod.
- ☐ External gland O-ring and back-up ring remain fully seated.
- ☐ Small OR020 is captured beneath the piston stack and is not visible or pinched.
- ☐ Piston seal is even around the piston circumference.
- ☐ Wear ring is centered and its split is not caught on a machined edge.
- ☐ Retaining nut is fully seated in the recorded orientation.

STOP CONDITION

Do not insert the assembly into the barrel if any seal appears rolled, cut, shaved, or partially out of its groove. Correcting the problem now is far easier than removing the cylinder after a leak test.

8.7 Prepare the Barrel and Remove the Cartridge Valve



Figure 8-10. External barrel threads and the gland/rod assembly at the barrel end. Clean the bore entry and threads before insertion.



Figure 8-11. Cartridge/holding valve removed so air and fluid can move freely while the rod assembly is inserted.

Procedure

1. Place the barrel on stable supports so the open gland end is accessible and cannot roll.
2. Clean the bore-entry chamfer, the first several inches of the cylinder bore, and the external barrel threads with lint-free material.
3. Inspect the entry for a burr that could cut the piston seal. Correct only minor raised material without changing the machined sealing diameter.
4. Remove the cartridge/holding valve before inserting the piston. This reduces hydraulic suction and allows trapped air to escape while the rod assembly enters the barrel.
5. Protect the removed valve and open port from contamination. Keep the valve O-rings away from dirt and sharp edges.
6. Coat the bore-entry chamfer, piston seal, wear ring, and nearby bore with clean ATF.

SAFETY BOUNDARY

This procedure applies to a removed cylinder on the bench. Never loosen a holding valve or gland while the cylinder is installed under a supported or suspended boom load.

8.8 Insert the Piston and Rod Assembly into the Barrel



Figure 8-12. The piston must enter the lubricated bore squarely; the gland then seats into the barrel end beneath the threaded retaining cap.

Procedure

1. Position the rod assembly directly in line with the cylinder bore. Support the rod so the piston does not enter at an angle.
2. Center the piston seal and wear ring at the bore entry. Verify no part of either component is hanging over the chamfer.
3. Push the piston into the chamfer by hand. Apply steady, even pressure while keeping the rod aligned with the barrel centerline.
4. If additional force is required, use light and even rubber-mallet taps on a non-marring surface of the assembly. Never strike the polished chrome rod, seal lips, or barrel threads.
5. Continue until the piston seal and wear ring have passed completely into the bore.
6. Push the rod assembly farther into the barrel until the gland reaches and begins to seat in the barrel-end bore.
7. Move the rod slightly through its travel. The assembly should move smoothly without scraping, a sudden hard spot, or a metallic sound.

IF THE PISTON STOPS

Do not increase hammer force. Withdraw the piston enough to inspect the seal and wear ring. A folded seal, displaced wear ring, dry chamfer, or off-center rod is more likely than a need for greater force.

8.9 Seat the Gland and Install the Threaded Retaining Cap



Figure 8-13. Separate threaded cap that retains the gland at the barrel end.



Figure 8-14. Installed retaining cap and its 7/64-inch locking screw.

Procedure

1. Clean the gland seating area, the retaining-cap internal threads, and the external barrel threads. Apply only a light film of clean ATF to the sealing and threaded surfaces.
2. Push the gland squarely into the barrel-end bore while watching the OR236 O-ring and BU236 back-up ring. Both seals must enter without rolling or shaving.
3. Position the separate threaded retaining cap over the gland and against the external barrel threads.
4. Start the retaining cap by hand for several complete turns. Stop if the cap rocks, binds immediately, or fails to advance evenly.
5. Use the 36-inch pipe wrench only after the retaining cap is clearly engaged and turning correctly. Apply controlled force and avoid crushing or distorting the cap or barrel.
6. Tighten the retaining cap to the same fully seated position documented before disassembly. The cap mechanically retains the gland in the barrel end.
7. Reinstall the 7/64-inch cap locking screw and verify it is secure.

CROSS-THREAD PREVENTION

The retaining cap should start by hand. If it binds immediately or rocks on the external barrel threads, back it off and realign it. A long pipe wrench can destroy the barrel and cap threads very quickly if used to force a cross-threaded cap.

8.10 Reinstall the Cartridge Valve and Complete the Bench Check



Figure 8-15. Cartridge/holding valve. Lubricate the O-rings, start the threads by hand, and return the valve to its original seated position.

Valve Installation

1. Inspect every valve O-ring for a cut, flat spot, or displaced back-up ring. Replace any damaged sealing element before installation.
2. Apply clean ATF to the valve O-rings and threads.
3. Clean the valve cavity and verify no lint, dirt, or metal fragment remains inside the port.
4. Start the valve by hand and thread it into the block without forcing it.
5. Tighten the valve to its original seated position using the original tool engagement. No verified torque for this specific cartridge was identified in the supplied documentation.
6. Cap or plug both hydraulic hose ports until the cylinder is ready for installation.

Bench Functional Check

- ☐ Rod moves smoothly through the available stroke by hand.
- ☐ Gland remains seated, the retaining cap is fully installed, and the 7/64-inch locking screw is secure.
- ☐ Cartridge valve is seated and all valve O-rings are contained.
- ☐ No seal material or masking tape remains outside a groove.
- ☐ No external ATF seepage appears after the rod is moved.
- ☐ Ports remain capped against contamination.

8.11 Completed Cylinder and Readiness for Installation



Figure 8-16. Reassembled elevation cylinder ready for mounting-pin preparation and installation in Chapter 9.

Final Reassembly Checklist

- ☐ Gland internal seals installed in the correct orientation.
- ☐ Gland external O-ring and back-up ring fully seated.
- ☐ Small rod O-ring installed and protected during assembly.
- ☐ Piston seal and wear ring centered and undamaged.
- ☐ Retaining nut installed with the flanged face outward and fully seated.
- ☐ Piston entered the barrel without cutting or rolling a seal.
- ☐ Gland seated in the barrel and retained by the fully threaded cap and 7/64-inch locking screw.
- ☐ Cartridge valve reinstalled with serviceable O-rings.
- ☐ Hydraulic ports capped or plugged.
- ☐ Chrome rod protected from impact and contamination.
- ☐ Cylinder identification and hose orientation records retained.

CHAPTER RESULT

The cylinder is now mechanically reassembled. Do not pressurize it on the ground with improvised hoses or unrestrained components. Proceed to Chapter 9 for mounting-pin preparation, base-pin-first installation, hose connection, and controlled recommissioning.

Chapter Summary

The rod, gland, piston, threaded retaining cap, barrel, and cartridge valve have been rebuilt and returned to their operating arrangement using the field-verified procedure. The next chapter covers cleaning the pivot pins and bores, aligning the cylinder in the boom, installing the base and rod-end pins, securing the retaining plates, reconnecting the hydraulic hoses, and preparing for the first low-speed movement test.

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Chapter 9

Lift Cylinder Installation



Figure 9-1. Rebuilt lift cylinder prepared for installation into the Telsta A-28D boom assembly.

Chapter Objective

Install the rebuilt lift cylinder using the field-verified sequence: create clearance with the boom support, slide the cylinder halfway into the boom, reconnect the labeled hydraulic hoses, rotate and seat the cylinder at the rear mount, install both pins and retaining plates, position the rod with a 6-inch socket extension, remove temporary supports, and reinstall the cartridge valve.

9.1 Installation Sequence

1. Raise the boom for clearance

Use the bottle jack and 2x4 in the boom cradle. Raise only enough to slide the cylinder into position.



2. Slide the cylinder halfway into the boom

Stop while the hydraulic hose ports remain accessible.



3. Reconnect the labeled hydraulic hoses

Attach each hose to its matching labeled port.



4. Rotate and seat the base end

Turn the cylinder so the cartridge-valve bore faces upward, then slide it into the rear pin assembly.



5. Install and retain the rear pin

Use a round teeter support for alignment. Stop the pin about 1/4 inch short, install the plate, then seat the pin and tighten the bolt.



6. Position the rod and install the front pin

Use a 6-inch socket extension through the rod-eye bushing; support the cylinder with a strap while aligning the front pin holes.



7. Remove temporary supports and reinstall the valve

Remove the teeter support and strap, then reinstall the cartridge valve with a 10-inch adjustable wrench.

9.2 Raise the Boom and Stage the Cylinder



Figure 9-2. Actual bottle-jack and 2x4 support arrangement used in the boom cradle.

Procedure

1. Place the bottle jack in the boom cradle and position the 2x4 as a load-spreading block between the jack and the boom.
2. Raise the boom arm only high enough to create clearance for the rebuilt cylinder to slide back into position.
3. Protect the chrome rod, hose fittings, valve block, and mounting eyes while moving the cylinder into the boom.
4. Slide the cylinder approximately halfway into the boom assembly, then stop while the hydraulic ports remain accessible.

SUPPORT THE BOOM

Keep the boom supported throughout the installation. Do not use the hydraulic hoses or the partially inserted cylinder as structural support.

9.3 Reconnect the Hoses and Orient the Cylinder



Figure 9-3. Actual cylinder, hydraulic hose, and port area within the confined boom interior.



Figure 9-4. Actual cartridge valve and cartridge-valve bore.

Procedure

1. Locate the identification labels placed on the hydraulic hoses and the matching cylinder ports during removal.
2. With the cylinder still approximately halfway into the boom, reconnect each labeled hose to its matching labeled port.
3. Confirm the fittings start correctly and the hoses are routed clear of the pin bores and boom structure.
4. Rotate the cylinder until the cartridge-valve bore faces upward.
5. Slide the cylinder farther into the boom and into the rear pin assembly.

ORDER OF OPERATION

Reconnect the hoses before the cylinder is fully seated. The fittings are easier to reach while the cylinder is stopped halfway into the boom.

9.4 Align and Start the Rear Pin



Figure 9-5. Actual mounting pin showing the retaining-plate notch and the outer area used only for rotation correction.



Figure 9-6. Actual custom pin driver used to reach the recessed pin location.

Procedure

1. Start the rear pin into the first rear pin hole with the retaining-plate notch oriented correctly for the hold-down plate.
2. Lift the cylinder and place a strong bar or other round cylindrical object under the center of the cylinder.
3. Use the round object as a teeter point to shift the cylinder until the rear pin holes are nearly aligned.
4. Tap the rear pin far enough to capture the alignment, then use the custom pin driver to continue driving the pin.
5. Do not drive the pin fully into its final position. Stop with the notch approximately 1/4 inch away from its final location.
6. If the pin rotated, use a small pair of channel locks only on the outermost end away from the notch. Do not raise burrs on the bearing/contact surface.

TEMPORARY TEETER SUPPORT

The round object under the center of the cylinder is an alignment aid only. Remove it after both mounting pins are secure.

9.5 Install the Rear Retaining Plate

1. Stop the rear pin short

Leave the retaining-plate notch approximately 1/4 inch from its final position.



2. Insert the retaining plate

Slide the plate snugly into the pin notch.



3. Start the retaining bolt

Thread the retaining bolt by hand so it is engaged but not fully tightened.



4. Drive the pin fully home

Use the custom pin driver until the plate is firmly seated against the boom arm.



5. Tighten the retaining bolt

Use the recessed socket arrangement shown below and confirm the plate remains engaged in the notch.



Figure 9-7. Actual 9/16-inch impact socket, 1/2-inch impact swivel, and 5-inch impact extension used for the recessed retaining bolt.

9.6 Position the Rod for the Front Pin



Figure 9-8. Actual front rod-eye bushing. Feed the 6-inch socket extension through this opening.



Figure 9-9. Remove the cartridge valve during rod positioning when needed to reduce suction resistance.

Procedure

1. Feed a 6-inch socket extension into the rod-side pin bushing.
2. Use the extension as a handle to rotate the rod eye and pull the rod outward to approximately the length required to reach the front pin assembly.
3. If the cartridge valve has already been installed, remove it to reduce suction resistance while the rod is being pulled.
4. Push the rod end into the front pin assembly.
5. If light tapping is needed to force alignment, strike only the very end of the rod-eye assembly. Do not strike the chrome rod.
6. Use a belt or strap to hold the cylinder temporarily while the front pin holes are aligned.
7. Continue using the socket extension to rotate and align the rod eye until the holes are close enough to start the front pin.

PROTECT THE CHROME ROD

Do not clamp, grip, or strike the polished chrome surface. Damage to the chrome can cut the new rod seal during operation.

9.7 Install and Retain the Front Pin



Figure 9-10. Actual front rod pin, front retaining plate, and retaining bolt.

Procedure

1. Start the front pin once the socket extension has brought the front pin holes into close alignment.
2. Use the same staged procedure used at the rear: keep the notch oriented correctly and drive the pin until approximately 1/4 inch remains.
3. Slide the front retaining plate into the notch and start the retaining bolt by hand.
4. Drive the front pin the rest of the way until the retaining plate is firmly seated against the boom arm.
5. Tighten the retaining bolt and verify the plate remains engaged in the notch.
6. Remove the temporary belt or strap after the front pin and retaining plate are secure.

FRONT PIN IDENTIFICATION

The photograph above shows the front rod-end pin assembly. Do not use it as a rear-pin reference.

9.8 Remove Temporary Supports and Reinstall the Cartridge Valve



Figure 9-11. Actual confined boom interior after the cylinder is positioned.



Figure 9-12. Cartridge valve and valve bore used for the final installation step.

Procedure

1. Remove the round bar or cylindrical object used as the teeter support beneath the center of the cylinder.
2. Confirm both mounting pins are fully installed and both retaining plates are seated in their notches.
3. Confirm both retaining bolts are tight.
4. Reinstall the cartridge valve into its bore.
5. Use a 10-inch adjustable wrench; this size fits within the confined space of the boom arm.
6. Remove all socket extensions, straps, tools, supports, and loose hardware from the boom assembly.

MECHANICAL COMPLETION

After the cartridge valve is reinstalled and all temporary tools and supports are removed, the cylinder is mechanically installed.

9.9 Mechanical Installation Checklist

- | | |
|--|--|
| ☐ Boom raised only enough to provide installation clearance. | ☐ Rear retaining bolt tightened with the recessed socket setup. |
| ☐ Cylinder stopped halfway into the boom before hose reconnection. | ☐ 6-inch socket extension used through the rod-side bushing. |
| ☐ Each labeled hose connected to its matching labeled port. | ☐ Cartridge valve removed during rod positioning when required to reduce suction. |
| ☐ Cartridge-valve bore oriented upward before the rear end was seated. | ☐ Chrome rod was not struck, clamped, or gripped. |
| ☐ Rear pin notch oriented correctly. | ☐ Temporary belt or strap used during front-pin alignment and then removed. |
| ☐ Round teeter support used to align the rear pin holes. | ☐ Front pin installed with the same staged plate-and-bolt procedure. |
| ☐ Rear pin stopped approximately 1/4 inch short before plate installation. | ☐ Round teeter support removed. |
| ☐ Pin rotation corrected only at the outer end away from the notch and contact surface. | ☐ Cartridge valve reinstalled with a 10-inch adjustable wrench. |
| ☐ Rear retaining plate installed and bolt hand-started before final pin seating. | ☐ No tools, extensions, straps, supports, or loose hardware remain in the boom. |

Chapter Summary

The lift cylinder is mechanically installed. The cylinder was inserted halfway before hose connection, oriented with the cartridge-valve bore upward, secured first at the rear mount and then at the front rod mount, and completed with both retaining plates and bolts secure. Proceed to Chapter 10 for hydraulic recommissioning and controlled testing.

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Chapter 10

Hydraulic Recommissioning and Testing



Figure 10-1. Actual lift cylinder, hydraulic hose, and port area before first operation.

Chapter Objective

Return the rebuilt lift cylinder to service using a controlled first-operation sequence, purge trapped air through full-stroke operation, verify hydraulic-fluid level, and confirm that the cylinder, valve, hoses, pins, and retaining hardware remain leak-free and secure.

10.1 Pre-Start Inspection



Figure 10-2. Cartridge valve and bore area.



Figure 10-3. Front rod pin, retaining plate, and retaining bolt.

- ☐ Rear and front mounting pins fully seated.
- ☐ Both retaining plates engaged in the pin notches.
- ☐ Retaining bolts tightened and plates seated against the boom structure.
- ☐ Hydraulic hoses connected to their matching labeled ports.
- ☐ Hoses routed without kinks, pinching, or contact with moving hardware.
- ☐ Cartridge valve installed with its O-ring lubricated and undamaged.
- ☐ Temporary teeter support, strap, socket extension, and all loose tools removed.
- ☐ Boom area clear of personnel and obstructions.
- ☐ Hydraulic reservoir checked with the boom in the boom rest.
- ☐ Fluid level splitting the reservoir sight glass; do not overfill.

CARTRIDGE VALVE INSTALLATION

The factory procedure specifies lubricating the cartridge-valve O-ring with hydraulic oil and installing the cartridge to approximately 30 ft-lb (4.1 kg-m). Never remove the valve unless the boom is securely supported.

10.2 Controlled First Operation and Air Purge

Procedure

1. Operate the lift from the ground-control station with the work area clear and the vehicle secured on a level surface.
2. Start the hydraulic power source and raise the boom only a short distance. Stop and inspect the hose fittings, cylinder ports, cartridge valve, gland area, and surrounding structure for fresh oil.
3. If no leakage is present, continue raising the boom slowly until the lift cylinder reaches full stroke. Do not hold the control against the end of stroke longer than necessary.
4. Lower the boom slowly to the boom rest. Observe the cylinder throughout travel for jerking, binding, unusual noise, hose movement, or pin rotation.
5. Repeat slow full-stroke raise-and-lower cycles as needed until motion is smooth and trapped air has been returned to the reservoir.
6. With the boom fully lowered in the boom rest, shut down the power source and recheck the hydraulic-fluid level. Add approved ATF only as required.
7. Perform a final leak inspection immediately after cycling and again after the machine has rested several minutes.

STOP IMMEDIATELY

Stop operation if a pressurized leak, sudden jerking, metal-to-metal contact, hose pinching, pin rotation, retaining-plate movement, or abnormal noise is observed. Correct the condition before continuing.

10.3 Final Acceptance Check



Figure 10-4. Actual confined boom interior and hydraulic hose/port area requiring final inspection.

Acceptance Item	Pass Condition
Cylinder travel	Raises and lowers smoothly through full stroke without binding or persistent jerking.
External leakage	No oil at the gland, cartridge valve, hose fittings, ports, or cylinder body.
Mounting pins	No visible rotation, walking, or movement in either mount.
Retaining hardware	Both plates remain fully engaged; retaining bolts remain tight.
Hose routing	No kinks, rubbing, pinching, or interference through the full operating range.
Reservoir level	Fluid splits the sight glass with the boom fully lowered in the boom rest.
Operational result	Ground and basket controls operate normally; lift holds position without abnormal drift.
RETURN TO SERVICE	
The lift may be returned to service only after every acceptance item passes and no hydraulic leakage is present.	

Source note: Telsta A-28D Service and Repair/Parts Manual: hydraulic-fluid level inspection, elevation-cylinder valve installation, full-stroke test, and leakage inspection procedures.

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Chapter 11

Maintenance and Troubleshooting



Figure 11-1. Chrome rod and rod-end surfaces should remain clean, smooth, and damage-free.

Chapter Objective

Preserve the rebuilt lift cylinder through routine visual inspection, pin and hose checks, proper lubrication, and early correction of leakage, binding, drift, or mounting-hardware movement.

11.1 Routine Inspection



Figure 11-2. Mounting pin notch and outer grip area.



Figure 11-3. Hose and port routing inside the boom.

Interval	Required Check
Before each use	Check the reservoir sight glass with the boom in the boom rest. Inspect the cylinder, valve, fittings, hoses, and pedestal area for hydraulic oil. Do not operate the lift until any leak is repaired.
Weekly	Inspect both cylinder pivot pins for wear, correct retaining-plate position, and lubrication. Verify that the pins do not rotate in the mounts.
Monthly / periodic	Inspect the cylinder body, chrome rod, tubing, hose connections, and exposed hose routing for corrosion, scoring, cuts, abrasion, looseness, or leakage.
After any repair	Cycle the cylinder through full stroke, inspect all fittings for leakage, and confirm both attachment points remain secure.
Lubrication	Lubricate both anchor pins during installation and periodic service using the machine lubrication schedule and appropriate grease for the joint.
Storage / cleaning	Keep the exposed rod clean. Do not use abrasive tools on the chrome surface. Remove dirt before cycling the rod into the gland.

11.2 Troubleshooting Guide

Symptom	Inspection and Corrective Direction
Oil at hose fitting or port	Stop the lift. Relieve pressure. Inspect for a loose fitting, damaged sealing surface, damaged O-ring, crossed threads, or incorrect hose routing. Repair before operation.
Oil at cartridge valve	Support the boom before valve removal. Inspect the valve O-ring and bore, lubricate with clean hydraulic oil, reinstall correctly, and retest for leakage.
Oil at gland or along chrome rod	Inspect the rod for scoring or corrosion. Continued leakage indicates damaged rod packing or gland seals and requires cylinder removal and resealing.
Jerky or uneven movement	Check reservoir level, trapped air, hose restriction, pin alignment, and mounting bind. Perform controlled full-stroke cycles only after confirming no mechanical interference.
Cylinder drifts or will not hold	Remove the lift from service. Check for external leakage, holding-valve malfunction, or internal cylinder bypass. Proper hydraulic testing is required.
Pin rotates or walks outward	Stop operation. Inspect the retaining plate, notch orientation, bolt security, pin wear, and mount wear. Correct before cycling the boom.
Unusual noise or hard movement	Stop and inspect for low fluid, cavitation, hose restriction, misalignment, dry pins, or contact between the cylinder and boom structure.
Repeated low fluid level	Find and repair the leak. Do not repeatedly top off the reservoir without identifying the source of fluid loss.
NO LEAK IS ACCEPTABLE Hydraulic oil found around the cylinder, hoses, ports, valve, or pedestal indicates a possible leak. The factory inspection procedure states that the lift must not be operated until the leak is repaired.	

11.3 Remove From Service When

- ☐ A pressurized hydraulic leak is present.
- ☐ The boom settles or drifts unexpectedly.
- ☐ A mounting pin rotates, walks outward, or shows visible wear.
- ☐ A retaining plate is loose, bent, or not fully engaged.
- ☐ The chrome rod is scored, bent, corroded, or peeling.
- ☐ A hose is kinked, abraded, pinched, swollen, or leaking.
- ☐ The cylinder binds, jerks, or makes abnormal noise after air purge.
- ☐ The cartridge valve or its fittings cannot be secured without leakage.
- ☐ The hydraulic-fluid level repeatedly drops.
- ☐ Any mounting eye, bushing, boom bracket, or weld appears damaged.



Figure 11-4. Retaining plate and bolt security are part of every periodic mounting-pin inspection.

QUALIFIED REPAIR

Valve diagnosis, pressure testing, structural repair, and any work involving an unsupported boom must be performed with the correct support equipment and by a person qualified for aerial-lift hydraulic service.

Source note: Telsta A-28D Service and Repair/Parts Manual: daily, weekly, monthly, and annual hydraulic-cylinder inspection guidance.

BTM-001

Chapter 12

Final Checklist and Reference Appendix



Figure 12-1. Matched replacement sealing elements used in the documented rebuild.

Chapter Objective

Provide one concise final checklist and a single reference location for the verified cylinder dimensions, factory hydraulic specifications, seal-kit identification, field tools, and service records used throughout this rebuild.

12.1 Verified Specifications

Reference	Verified Value	Source / Note
Machine	Telsta A-28D	Non-insulated aerial lift.
Component	Elevation / lift cylinder	Documented cylinder rebuilt and returned to service.
Factory assembly	T-74446	Elevation cylinder assembly listed in factory parts manual.
Factory packing kit	T-76349	Packing kit listed for the elevation cylinder assembly.
Cylinder markings	T-88887; 7911-001-09-10	Markings recorded from the documented cylinder.
Rod diameter	1.750 in.	Field measured.
Cylinder bore	3.500 in.	Field measured.
Hydraulic fluid	Dexron ATF Type A	Factory capacity section; later maintenance guidance allows Mobil ATF 220 or equivalent Dexron II.
Reservoir capacity	7 pints (3.3 L)	Factory specification.
Operating pressure	1200 psi (82 bar)	Factory hydraulic-system specification.
Maximum system pressure	2400 psi (165 bar)	Factory hydraulic-system specification; not a normal adjustment target.
System flow	1.6 gpm (6.06 L/min)	Factory hydraulic-system specification.
Cartridge valve torque	Approx. 30 ft-lb	Factory elevation-cylinder valve installation specification.

UNSPECIFIED TORQUES

No verified factory torque value was established in this rebuild record for the piston retaining nut, threaded gland-retaining cap, gland locking screw, or pin retaining-plate bolts. Do not invent these values.

12.2 Seal and Tool Reference

Matched Seal Set

Part Code	Component	Location / Function
DRTU25-1.75-337	Rod U-seal	Internal gland pressure seal for the 1.750-in. rod.
ST-175	Wiper	Outermost gland seal; scraper lip faces outward.
OR236	Gland O-ring	Static external gland seal.
BU236	Back-up ring	Supports OR236 against extrusion.
PSI-3538	Piston seal	Pressure seal between hydraulic chambers.
612-350-050	Wear ring	Piston bearing band for the 3.500-in. bore.
OR020	Small rod O-ring	Static O-ring beneath the piston/spacer stack.

Field Tool Reference

Size	Tool	Primary Use
7/64 in.	Hex key	Gland locking set screw.
36 in.	Pipe wrench	Threaded gland-retaining cap.
2 in.	Box-end wrench	Piston retaining nut.
9/16 in.	Impact socket	Recessed pin retaining-plate bolt.
1/2 in. drive	Impact swivel	Angle correction through boom access.
5 in.	Impact extension	Reach to recessed retaining bolt.
6 in.	Socket extension	Temporary rod-end alignment pin and rod-positioning handle.
10 in.	Adjustable wrench	Cartridge valve installation in confined boom space.
Custom	Pin driver	Hammer-drill side handle, jack-post screw, foam spacer, and short sledge.

12.3 Final Completion Checklist

- ☐ Cylinder bore, rod, gland, piston, threads, pins, and bushings inspected.
- ☐ All seven matched sealing elements installed and lubricated with clean ATF.
- ☐ Rod threads protected while seals and components passed over them.
- ☐ Piston retaining nut, gland-retaining cap, and gland locking screw installed.
- ☐ Cartridge valve installed with lubricated O-ring.
- ☐ Hydraulic hoses connected to matching labeled ports.
- ☐ Rear and front mounting pins installed with notches correctly oriented.
- ☐ Both retaining plates fully seated and retaining bolts secure.
- ☐ Temporary alignment tools, strap, teeter support, and loose tools removed.
- ☐ Both anchor pins lubricated.
- ☐ Hydraulic reservoir filled to the sight-glass midpoint with boom in rest.
- ☐ Cylinder cycled through full stroke until movement is smooth.
- ☐ No leakage at gland, valve, ports, fittings, or hoses.
- ☐ No pin rotation, retaining-plate movement, hose interference, or abnormal noise.
- ☐ Final operational test completed from ground and basket controls.

Service Record

Record Field	Entry
Machine / Unit ID	
Cylinder markings	
Rebuild completion date	
Installer / technician	
Seal supplier / invoice	
Fluid added	
Initial leak test result	
Follow-up inspection date	

Source note: Factory specifications and inspection guidance are from the Telsta A-28D Service and Repair/Parts Manual. Field dimensions, cylinder markings, tools, seal codes, and procedures are from the documented successful rebuild.